VOL. XXIV, NO. 2 FEBRUARY, 1950

THE TOOL ENGINEER

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Behind every manufactured product is the tool engineer

Editorial

ANOTHER P&W ECONOMY FEATURE

"Pilot" principle — chamfer and groove at end of Gage — permits easy entry (see drawing), even with unskilled operators. Saves time and lost motion. Available on any P&W Cylindrical Plug Gage.

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February, 1950

Vol. XXIV No. 2

Editorial

A Fireside Chat on Progress

DURING RECENT MONTHS, your officers have taken long and unprecedented strides toward developing on an even higher plane the educational activities of ASTE.

This widespread movement had its inception in the months preceding our annual meeting at Pittsburgh, when added effort was concentrated on presenting an expanded, more complete schedule of technical sessions. The results were better than anticipated. Technical sessions at Pittsburgh had an unusually high level of attendance, and approval among attending members was evident.

For the Seventeenth Semi-Annual meeting at Montreal last October, the program of technical papers reached a new high both in number and in quality. An additional innovation was initiated for this meeting—complete preprints of technical papers, including illustrations, were available for study by members before and during the sessions.

Finally, our aim of a greater number of sessions with increasing quality of material has come a long way toward fulfillment with the forthcoming Eighteenth Annual Meeting in Philadelphia April 10-14. Over 20 technical sessions are scheduled, covering significant phases of tool engineering, and prepared by recognized authorities. Further, the annual meeting will be opened with one of the most important economic forums ever presented—bringing together four of the nation's leading economists to discuss fundamental problems in business and government.

An added feature of this expanded technical education program will bring copies of the technical papers at Philadelphia to the more than 30,000 engineers and executives who will attend. The papers, along with complete programs of the meetings, and guides to exhibitors and their products, will make up a special *Tool Engineer* which will be distributed to each registrant.

Plans for increased technical service to ASTE members and to industry do not stop here. Announced at Montreal, and now in process of study, is a far-reaching program of ASTE-sponsored research. These research projects, under the guidance of ASTE and with the cooperation of industry, will undertake studies of fundamental importance to tool engineering.

Another basic step, also in the organization stage, will provide for a nation-wide network of "points of contact"—key members who constantly can keep the headquarters technical staff apprised of new developments in tool engineering. Such intelligence will be reflected immediately, of course, in local and national meetings, and in the pages of *The Tool Engineer.*

All these programs for a bigger and better ASTE depend upon working members—members who will work in the spirit of exchange of knowledge to bring tool engineering information to all of ASTE's membership. With the conscientious help of every ASTE member, we can increase many times over the widespread technical activities of ASTE.

R. B. Douglas

President 1949-1950

THE TOOL ENGINEER is published monthly in the interest of the members of the American Society of Tool Engineers. Entered as second class matter, November 4, 1947, at the post office at Milwaukee, Wisconsin, under the Act of March 3, 1879. Yearly subscription, $2.00. Non-members, $6.00. Canada, $6.50; all other foreign countries, $8.00 per year.

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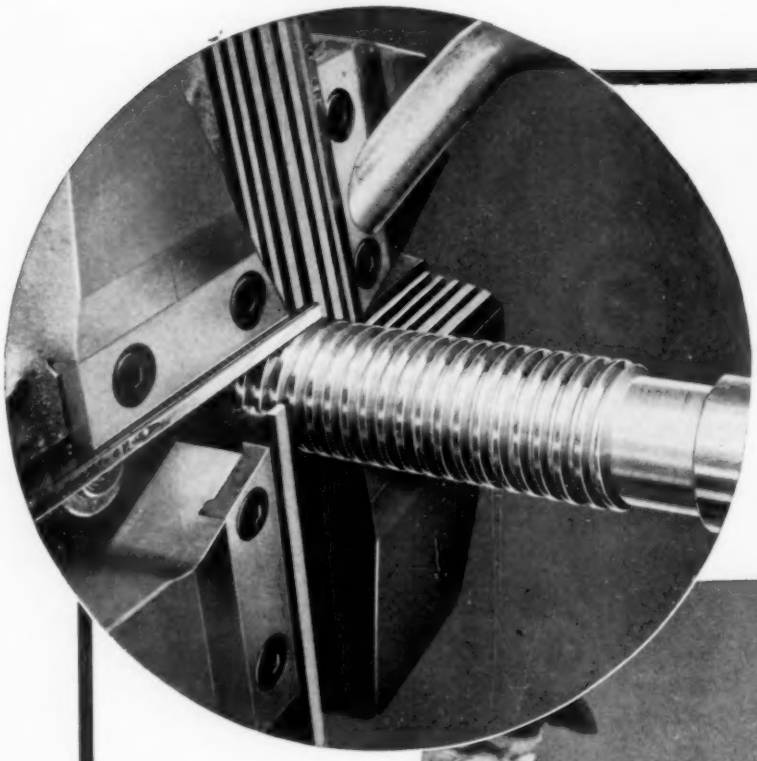
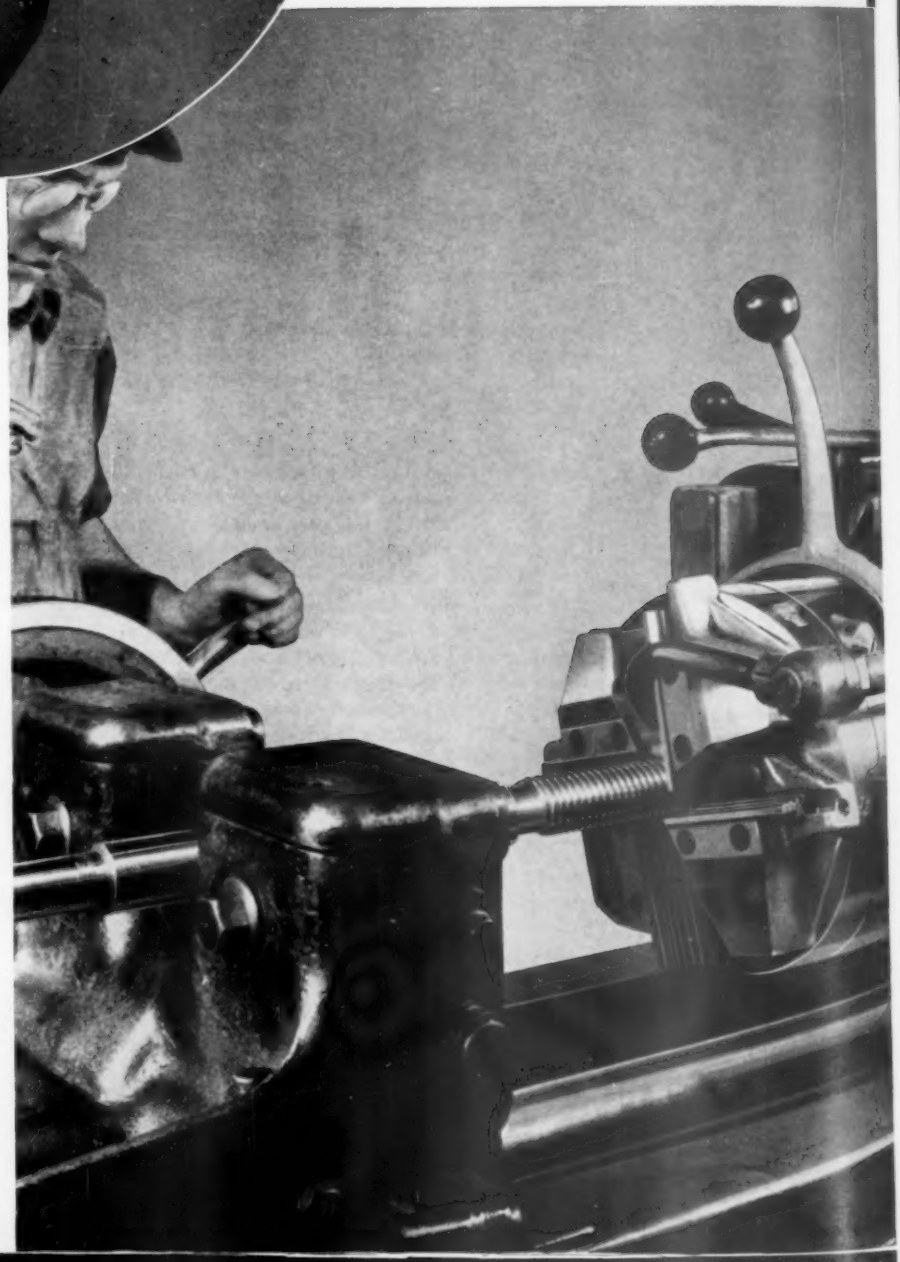


94.2% SAVING IN Threading Time



Right- and left-hand Threads in 4.66 min.

• 79.74 minutes formerly were required to cut threads on both ends of vise screws. The 1⅝" 4 pitch Acme threads 5¼" long on each end are now cut in one pass in 4.66 minutes floor-to-floor time, using a Landmaco Threading Machine equipped with Lead-screw Attachment.

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Write for Bulletin H-75.

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THREADING MACHINERY—THREAD CUTTING DIE HEADS—COLLAPSIBLE TAPS

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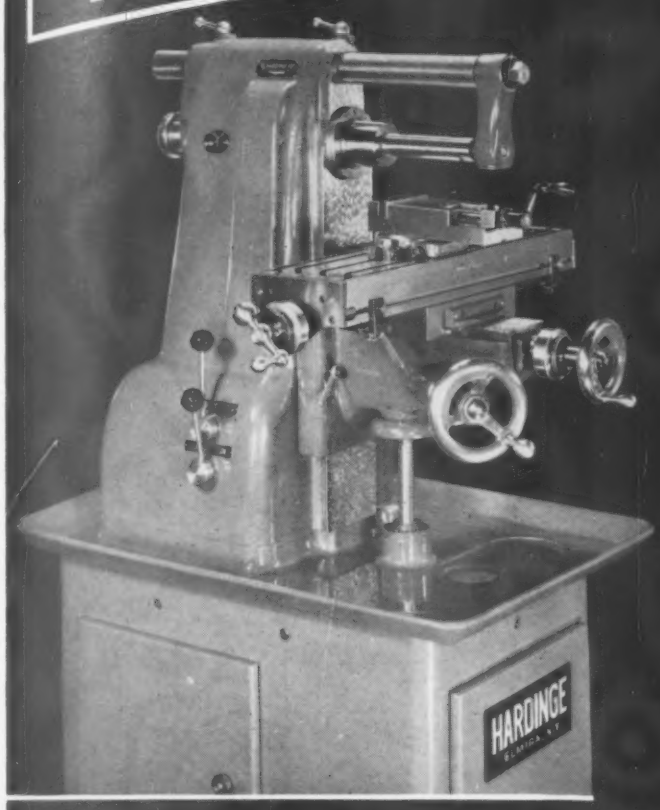
Two Essentials for Tool Rooms



Modern high speed precision tool room work calls for companion units that are rugged, with an abundance of power over the entire speed range in order to take on all jobs to their full capacity.

Hardinge TL 5 Lathe and TM-UM Milling Machines, with interchangeable attachments, are the units you should specify for your tool room. These low-cost, precision machines give you important advantages:

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Second—Tool room costs are reduced and results improved. Hardinge units speed up operations on the smaller work and give better results in accuracy and finish.

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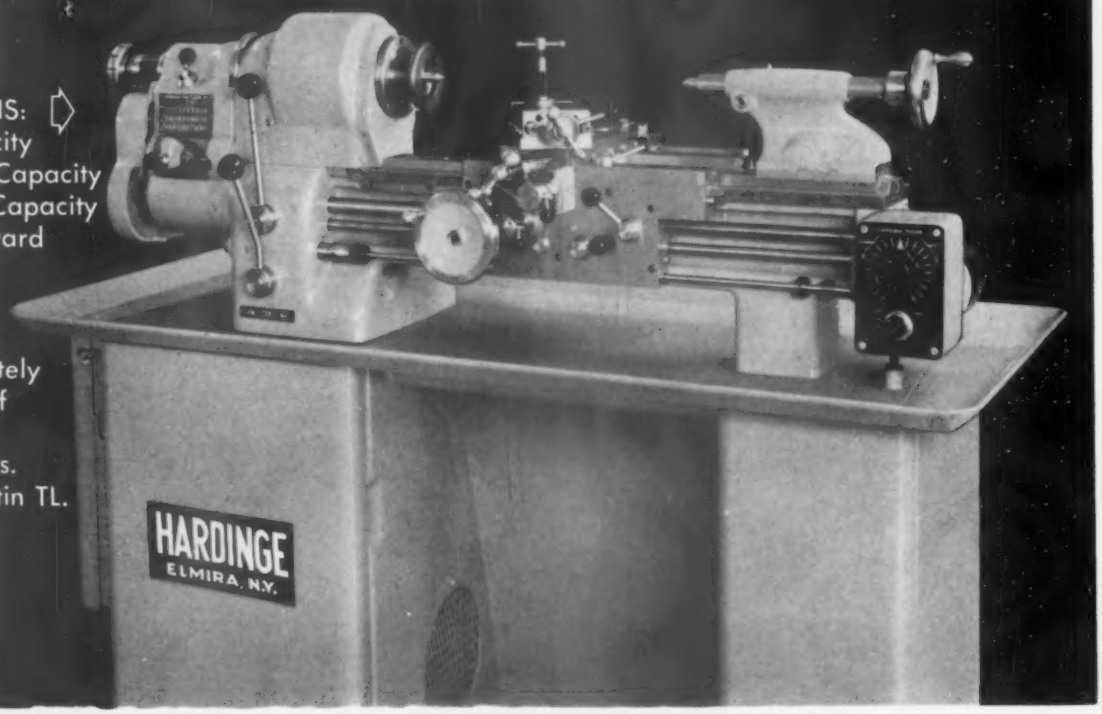

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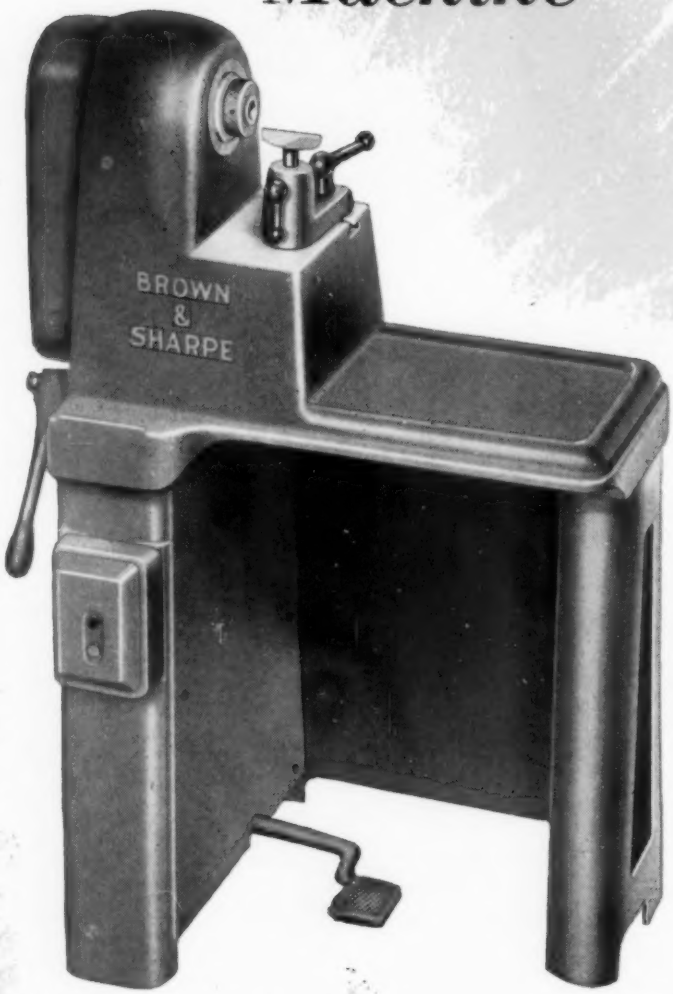

CAPACITY . . . spindle takes collets for up to 1" diameter stock. Swing over bed 9¾" diameter; over rest, 7¾" diameter.

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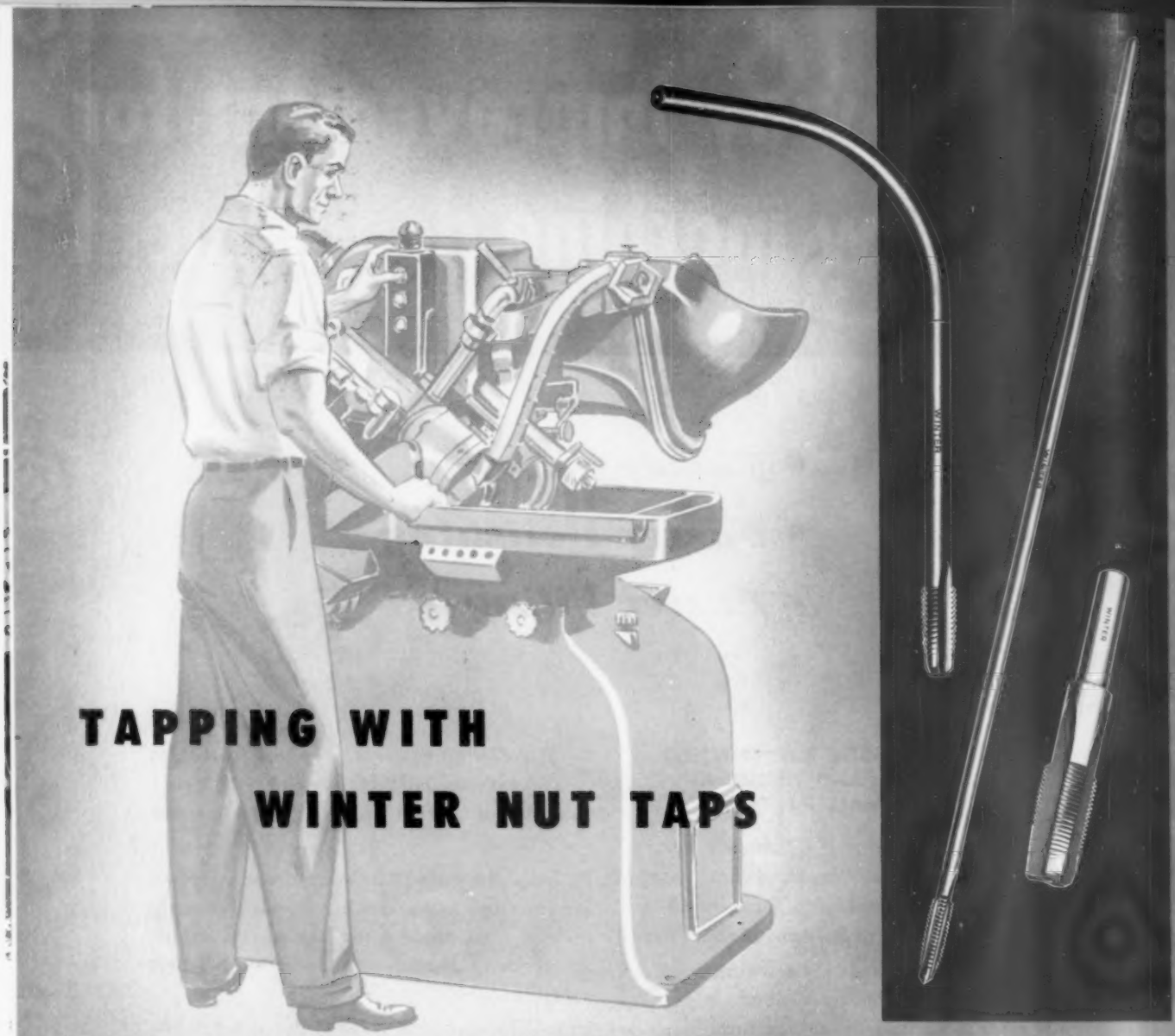

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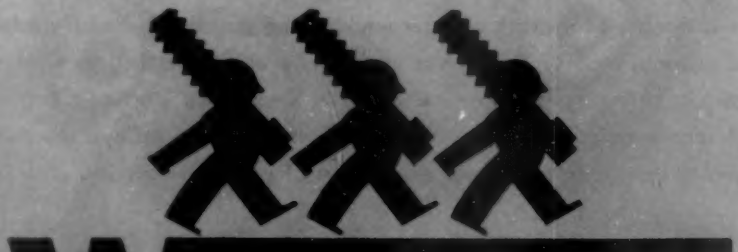
● One of the most punishing of tapping operations is in the production of the wide variety of nuts required in our modern industrial set-up. Winter Nut Taps of the straight shank, bent shank, and nib varieties are designed to meet this need. They are the result of long experience in design, heat treatment, and field operation. Winter service engineers are available to help you deliver the maximum production through the correct use of Winter Nut Taps. Winter makes all common types of taps and dies as well as taps for special applications.



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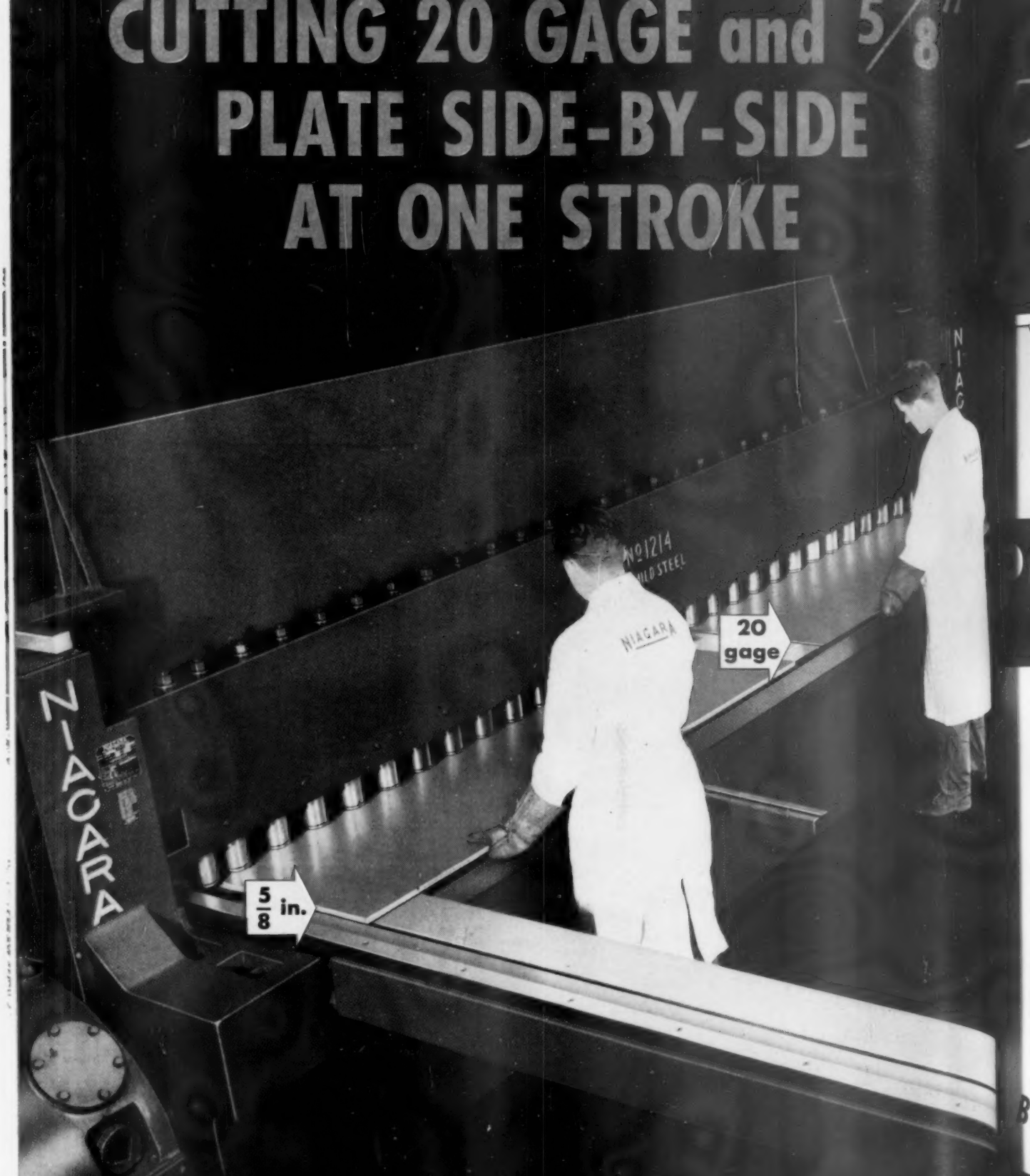
CUTTING 20 GAGE and 5/8" PLATE SIDE-BY-SIDE AT ONE STROKE



Photograph shows operators cutting ⅝" plate and 20 gage sheet steel simultaneously on NIAGARA Power Squaring Shear. No change in knife adjustment is necessary.

The ability of Niagara Power Squaring Shears to cut thick and thin plate both at the same time with the same knife setting is a dramatic demonstration. Visitors at our plant can see this done every day. There is no necessity for tinkering with the knife adjustment.

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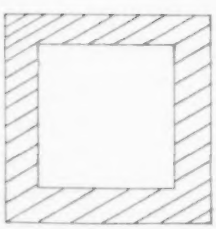

BED, CROSSHEAD & HOLDDOWN DESIGN

NIAGARA MACHINE AND TOOL WORKS, BUFFALO 11, NEW YORK

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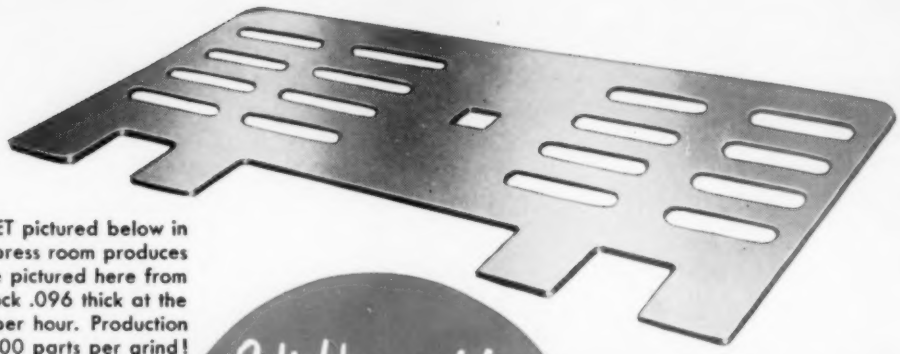
at the same time with the same knife setting is a dramatic demonstration.
Visitors at our plant can see this done every day.
There is no necessity for tinkering with the knife adjustment.



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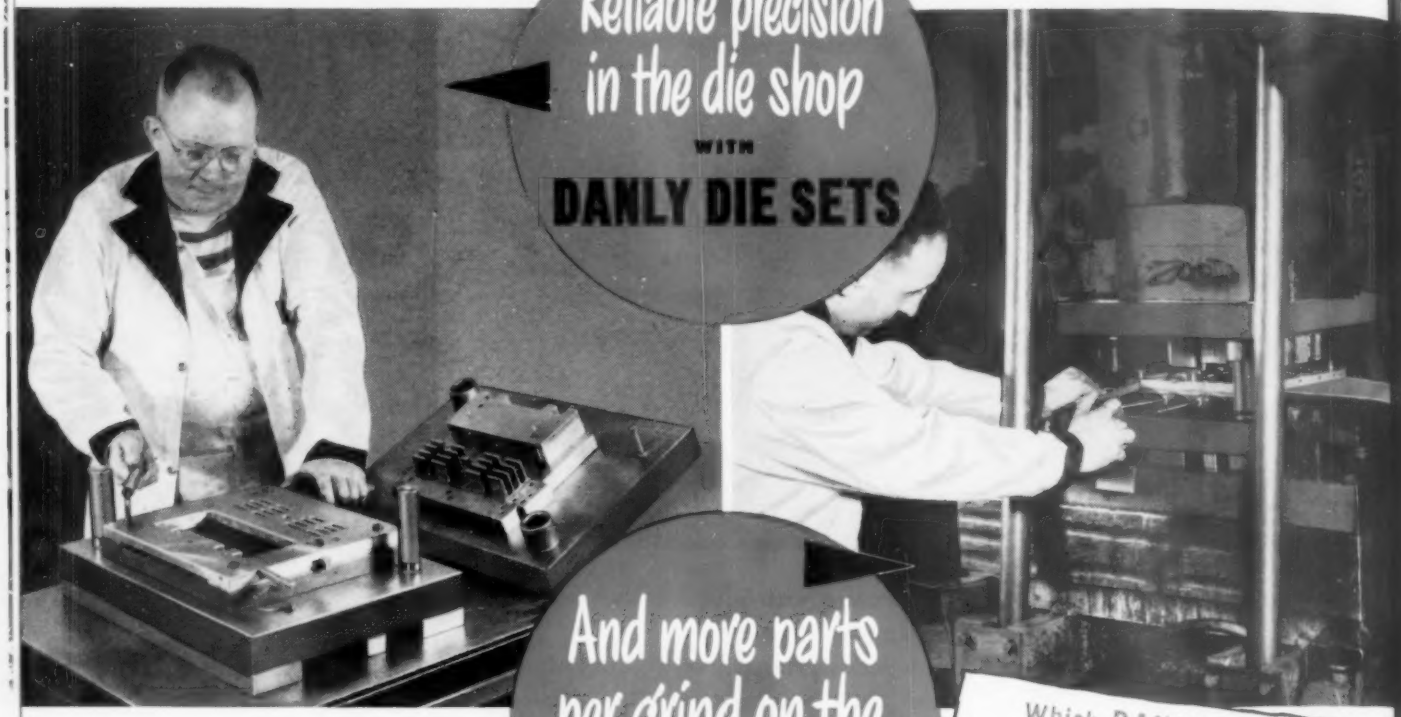

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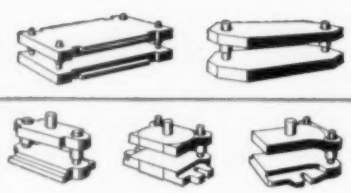

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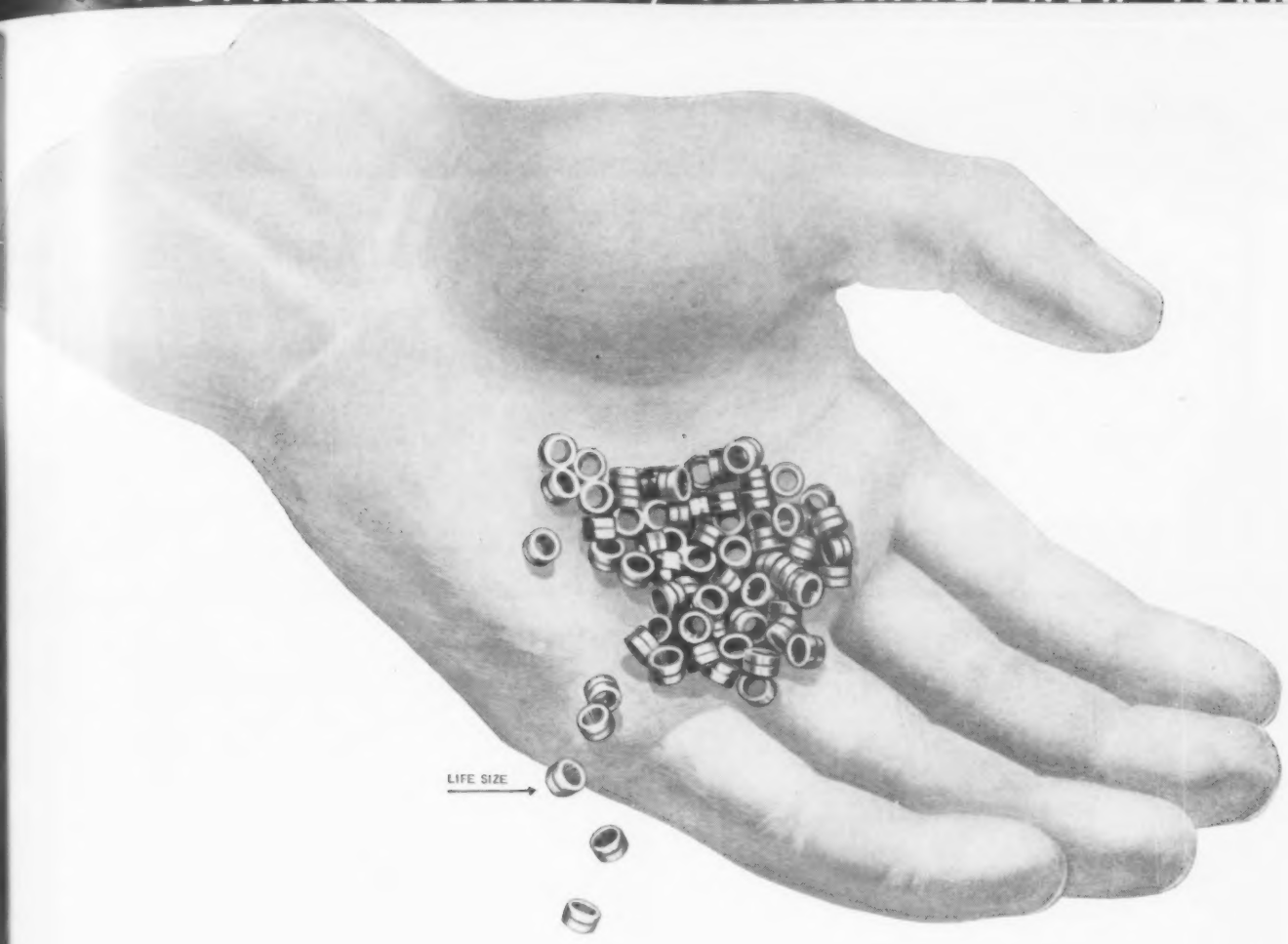

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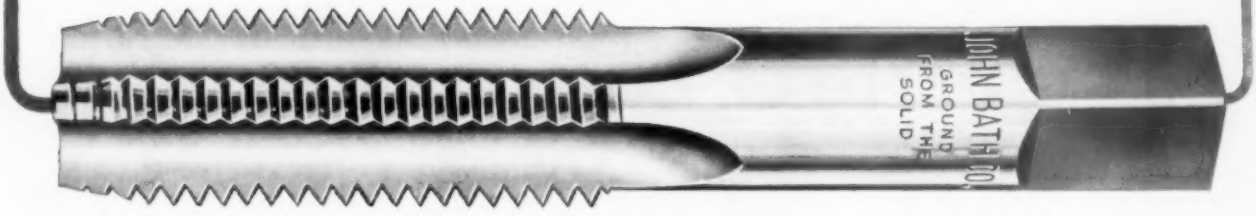

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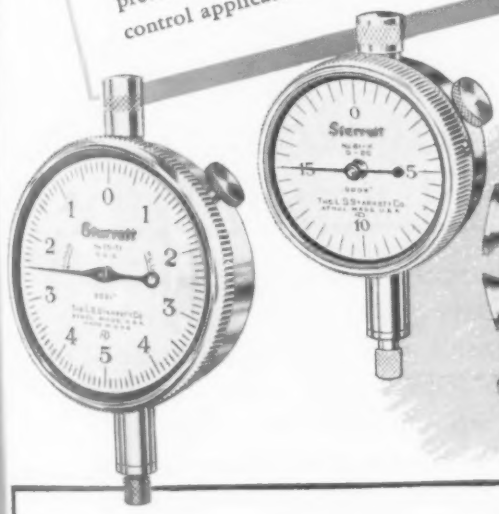

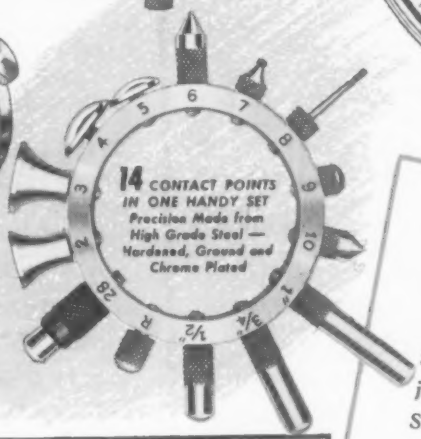

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An Evaluation of Dryseal Pipe Threads

By R. F. Holmes
STANDARDS ENGINEER
AC SPARK PLUG DIVISION
GENERAL MOTORS CORPORATION

AMERICAN STANDARD DRYSEAL Pipe Threads for general use are finding wide acceptance. Essentially they are self-sealing pipe threads developed for refrigeration, marine and automotive applications. Their use is especially applicable to obtain tight seals where a sealer is objectionable.

Dryseal pipe thread specifications are documentations of existing practices of many years standing. When originally developed about twenty years ago for refrigeration applications, they were known as SO_2 pipe threads. By controlling thread form truncation at root and crest, they provided contact or interference at these points first before the flanks engaged. It was this feature which eliminated the need for a sealer in the makeup of the joints. Over ten years ago, the SAE adopted a modified pipe thread with the same truncation as above at the root only. They were used for pipe threads on tube fittings and pipe threads in automotive applications. However, since control was only on truncation at the root, this did not provide contact at root and crest in all cases when flanks engaged. About five years ago, the SAE approved changing to the same truncation at root and crest as on the SO_2 pipe thread and changing the name to Dryseal.

American Standard regular pipe thread specifications do not provide for control of truncation at root and crest and do not provide for contact at these points in all cases when the flanks engage. AN-P-363 Aeronautical pipe thread specifications provide gages for controls of truncation at root and crest but do not provide for contact at these points in all cases when the flanks engage. In both of the latter cases, flank displacement may be necessary to obtain contact at root and crest and since this is not usually obtained, a sealer is used to obtain a tight seal.

Dryseal pipe thread design specifications for thread form truncation at root and crest allow no clearance at these points when the flanks engage. The minimum truncation at the root gives some interference with the minimum truncation at the crest. The limits of truncation at root and crest are reduced to amounts considered practical for manufacturing. In the makeup of the joint, the roots and crests contact at hand engagement and additional tightening by wrenching crushes the roots and crests to bring the flanks into engagement (See Fig. 1 and Tables I and II). It is this feature of the thread which eliminates the need for a sealer. A lubricant such as light oil may be used to prevent galling during makeup of the joints, unless its use is functionally objectionable. Corrections are made in the $\frac{1}{8}$ and $\frac{1}{4}$ inch sizes of dryseal pipe threads for a disproportionate number of threads for hand engagement and wrench take-up with respect to other sizes; otherwise, the general form and dimensions are the same as those of the American Standard regular pipe thread.

American Standard regular pipe thread design specifications for thread form truncation at root and crest allow clearance at these points when the flanks engage. The minimum truncation at the root is less than the maximum truncation at the crest resulting in a spiral clearance which necessitates the use of a sealer to prevent spiral leakage. The opposite extreme of limits of truncation at root and crest results in interference at these points which is slightly less than that of Dryseal pipe threads. (See Figs. 2 and 3 and Tables I and II.)

AN-P-363 Aeronautical Specifications for truncation at root and crest, except for 27 pitch threads, are approximately the same as the American National regular pipe thread. The 27 pitch thread minimum truncation at root and crest is the same as the American Standard regular pipe thread, but the maximum truncation at root and crest is less. All pitches by reason of their latitude in specified limits and tolerances for root and crest truncation permit some clearance at root and crest at one extreme and some interference at root and crest, at the other extreme. It is this clearance which requires the use of a sealer in the makeup of the joints to prevent spiral leakage. (See Fig. 3 and Tables I and II.)

General Applications

All three of the above specifications for truncation at root and crest are shown in American Standard Pipe Threads B2.1-1945, and National Bureau of Standards Supplement to Handbook H-28 (1944).

Dryseal pipe thread joints consist of external taper and internal taper or internal straight pipe threads. External and internal taper pipe threads are used for pipe joints in practically every type of service. They are generally con-

Table I—Pipe Thread Truncation Clearance

Thds. Per Inch	AM. STANDARD DRYSEAL			AM. STANDARD REGULAR			AN-P-363		
	Root Min. Trunc.	Crest Max. Trunc.	Clearance	Root Min. Trunc.	Crest Max. Trunc	Clearance	Root Min. Trunc.	Crest Max. Trunc.	Clearance
27	.0035	.0035	.0000	.0012	.0036	.0024	.0012	.0027	.0015
18	.0043	.0043	.0000	.0018	.0049	.0031	.0018	.0046	.0028
14	.0043	.0043	.0000	.0024	.0056	.0032	.0024	.0056	.0032
11½	.0052	.0052	.0000	.0029	.0064	.0035	.0029	.0064	.0035
8	.0069	.6900	.0000	.0041	.0078	.0037	.0041	.0078	.0037

Table II—Pipe Thread Truncation Interference

Thds. Per Inch	AM. STANDARD DRYSEAL			AM. STANDARD REGULAR			AN-P-363		
	Root Max. Trunc.	Crest Min. Trunc.	Interference	Root Max. Trunc.	Crest Min. Trunc.	Interference	Root Max. Trunc.	Crest Min. Trunc.	Interference
27	.0052	.0017	.0035	.0036	.0012	.0024	.0027	.0012	.0015
18	.0061	.0026	.0035	.0049	.0018	.0031	.0046	.0018	.0028
14	0061	.0026	.0035	.0056	.0024	.0032	.0056	.0024	.0032
11½	.0078	.0035	.0043	.0064	.0029	.0035	.0064	.0029	.0035
8	.0095	.0052	.0043	.0078	.0041	.0037	.0078	.0041	.0037

ceded to be superior for strength and seal. In hard or brittle material without heavy section, the internal taper pipe thread reduces trouble from fracture.

Mass Production Applications

Assemblies with external taper pipe thread and internal straight pipe thread are frequently more advantageous than all taper assemblies, particularly in automotive and other mass production industries where economy and rapid production are paramount considerations. Internal straight pipe threads are intended for relatively soft or ductile materials which will adjust themselves to the external taper thread when properly screwed together. They may be used in hard or brittle material with heavy sections for assembly with external taper threads. Assemblies in which both components have straight pipe threads are not made with Dryseal pipe threads. These should be made with mechanical straight pipe threads and with a gasket drawn down against a shoulder.

Dryseal external taper and internal taper pipe thread joints generally require more torque to produce a tight seal than external taper and internal straight pipe thread joints. This can be attributed to the greater length of thread in contact, and errors in lead and thread form which enter into makeup of taper pipe thread joints.

The torques required for sealing pressures normally encountered in refrigeration and automotive applications up to 200 psi in dryseal taper pipe joints vary with the size and material. Torques of 10 lb-ft for ⅛ size, 15 lb-ft for ¼ size, 18 lb-ft for ⅜ size, and 25 lb-ft for ½ size have proved satisfactory for mild steel components. The torques required for dryseal external taper and internal straight pipe thread joints for satisfactory tight seals of mild steel components are: 8 lb-ft for ⅛ size, 12 lb-ft for ¼ size, 15 lb-ft for ⅜ size and 20 lb-ft for ½ size. Satisfactory tight seals have also been made by wrenching two turns beyond the hand engagement of the components, which is sufficient to crush the average interference between roots and crests and engage the flanks, without setting up excessive stresses due to flank engagement if the root and crest interference is minimum.

The above torques should be satisfactory for higher pressures up to the point where the pressure starts to deform the component materials, in which cases higher torques may be necessary to give a tight seal. However, as the pressure increases, the thickness of material around both internal and external threads should be also increased to withstand the increased stress. For higher pressures it is also desirable to hold the internal taper thread to the minus tolerance on taper and the external taper pipe thread to the plus tolerance on taper to concentrate the stress at the large end of the joint.

For the 8 pitch sizes it may also be necessary, where the design limitations will not allow sufficient material thickness around the pipe threads, to reduce the allowable limits of truncation at crest and root and maximum amount of metal to be crushed before flanks engage.

Components Interchangeable

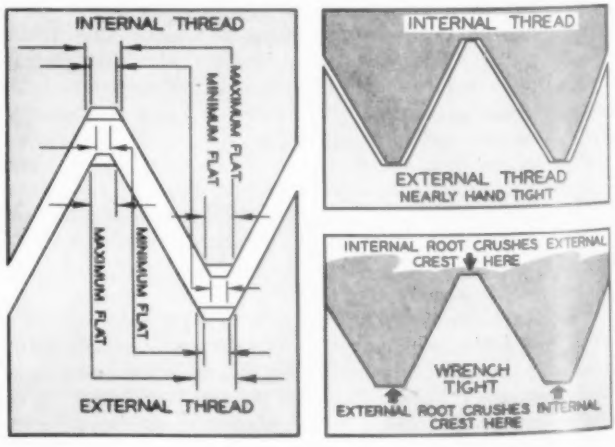
Dryseal pipe thread joints may be disassembled and reassembled with the same components or different components, the number of times depending only upon the length of full thread available for wrenching beyond the previous position in assembly.

A component having dryseal pipe threads will assemble with another component having American Standard regular pipe threads as readily as if both components had American Standard regular pipe threads. A tight seal may not be obtained without the use of a sealer, however, as only the major or minor diameter may be sealed depending upon which component has dryseal pipe threads.

Dryseal taps and chasers or dies must have thread form truncations at crest and root which will produce product thread form truncations at root and crest within the limits of tolerance. This can be controlled by checking new tools by projection on a comparator before using. Taps are specified with maximum truncation at the root or sharper and minimum truncation at the root may be less than that for product crest, but this should not result in a product crest truncation less than specified. Chasers are specified with minimum truncation at root and crest to provide for maximum wear.

Taps and chasers or dies should have suitable chamfered threads for lead as well as correct hook, relief, number of flutes and etc. for the material being processed. Lead screw tappers may be required to produce threads of correct form. A check of tools during production at intervals

Fig. 1. Design and engagement of internal and external dryseal threads are shown in the sketches above.



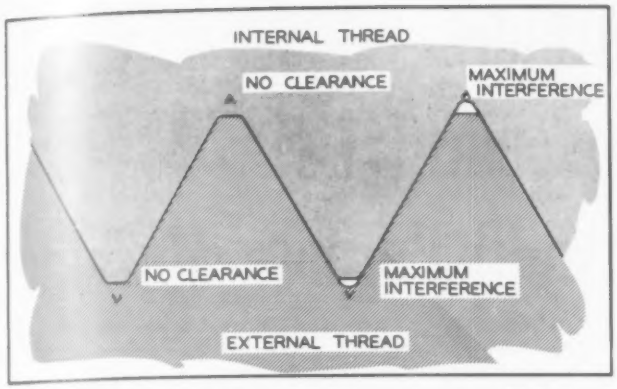


Fig. 2. The American Standard Dryseal Taper Pipe Thread (NPTF). When threaded joints are made up wrench-tight without lubricant or sealer, it is intended that the flanks and the crests and roots shall be in contact.

by projection on a comparator will assume maintenance of thread form.

Taper reaming the drilled hole before tapping taper pipe threads may be required for some materials while other materials may be tapped without taper reaming. Tap drills (and reamer, if used) for internal threads must permit tapping threads to the minimum pitch diameter with maximum truncation at crests for the full thread length and likewise the outside dimensions of the external thread sections must provide for cutting or rolling threads to the maximum pitch diameter with maximum truncation at crests for the full thread length.

Tools and gages for dryseal taper pipe threads are marked with the designation NPTF, the letter "F" indicating their purpose (Fuel or Dryseal). All large suppliers of tools and gages are able to provide delivery without undue delay. In addition, they are in a position to recommend the type of tool best adapted to the material and machining method being used.

Gages Relieved at Root

Dryseal plug and ring thread gages are truncated 0.20 to 0.25 p at crests and are relieved at root to assure checking pitch diameter only. On taper plug thread gages this principle prevents acceptance of threads which would be rejected on comparator checks.

Gaging dryseal internal taper pipe threads involves the use of two plug thread gages, the L_1 plug thread gage for checking the pitch diameter over the head engagement (or L_1) thread length, and the L_3 plug thread gage for checking the pitch diameter over the full thread length to assure adequate threads for wrench tightening. Gaging Dryseal internal straight pipe threads may also be accomplished through the use of the L_1 and L_3 plug thread gages, the L_1 plug thread gage providing a functional check of pitch diameter at the outer end of tapped hole and the L_3 plug thread gage checking the full thread length.

Comparator Suggested for Checking

Coordination of the two plug thread gages for internal taper pipe threads and coordination of the two ring thread gages for external taper pipe threads control and check thread taper. The L_1 plug thread gage is used first followed by the L_3 plug thread gage for checking internal taper pipe threads and the L_1 thin ring thread gage is used first followed by the L_2 full ring thread gage for checking external taper pipe threads. The relation of the gage reference points on both pairs of gages for internal and external threads must be within ½ turn (thread) either way in relation to the product reference point to assure taper within tolerances. Thread length must be sufficient to assure the L_2 and L_3 thread gages not hanging up on the imperfect or runout threads.

Gaging dryseal external taper pipe threads involves the use of two ring thread gages, the L_1 thin ring thread gage for checking the pitch diameter over the hand engagement (or L_1) thread length, and the L_2 full ring thread gage for checking the pitch diameter over the full thread length to assure adequate threads for wrench tightening.

The threads of tools and the threads of a percentage of the product, or of casts in the case of internal threads, should be checked on a comparator for thread form and truncation. Although the comparator is generally recommended, the truncation at major diameter of internal taper thread and minor diameter of external taper thread may be checked respectively with special taper plug and ring thread gages with thread angle less than 60 deg to clear the flank of the threads. The truncation at minor diameter of internal taper thread and major diameter of external taper thread may be checked respectively with plain taper plug gages and plain taper ring gages. For internal straight pipe threads, truncation at the major diameter may be checked with special straight plug thread gages with thread angle less than 60 deg to clear the flanks of the threads; the minor diameter may be checked with plain straight plug gages.

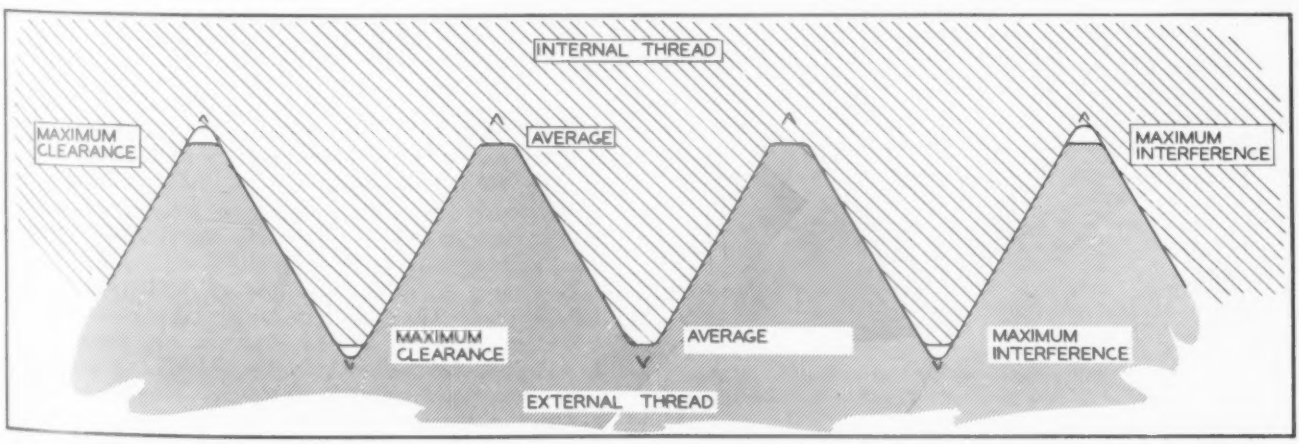


Fig. 3. American Standard Regular Taper Pipe Thread (NPT). When joints are wrench-tight without lubricant or sealer, flanks should be in contact. Minimum truncation at root is less than maximum truncation at crest, resulting in spiral clearance which necessitates use of a sealer to prevent spiral leakage. Aeronautical specifications for truncation at root and crest are similar.

Coordinated Control of Carbides Essential to Economical Use of Multi-Purpose Machines

By J. Smith

SUPERVISOR OF PLANNING
TRENTON WORKS, HOME LAUNDRY DIVISION
GENERAL ELECTRIC COMPANY

HOW IMPORTANT IS COORDINATED carbide control? The best answer to that—based on our experience with a continuous program of this type in the manufacture of G.E. automatic home laundry washers—is that we doubt that we could get along without it. We just couldn't operate as efficiently.

We have found that machines which we believed were operating at peak efficiencies could be retooled to greatly increase their output. We have been able to cut down-time —nonproductive idle time—for tool changes. We have been able to raise productivity per man hour; we have reduced tool costs; we have almost completely eliminated scrap due to faulty machining. Number of parts rejected by inspection for re-machining have been cut to a negligible quantity.

We have reduced the amount of tool grinding equipment required, and the number of trained grinder hands needed just to grind tools. We can salvage more tools; and we spoil fewer of them.

And above all, we have been able to further improve the quality of workmanship on automatic washer parts.

Inception of Plan

All of these things did not happen overnight. They are the result of continuous application of the principles of coordinated carbide control. As a matter of fact we actually decided to apply the plan before the new Trenton plant was in operation.

At the time, all special purpose machinery was being designed and built specifically for the use of carbide tools. Thus, even prior to the actual opening of the Trenton Works, the carbide coordinator worked closely with the manufacturers building the principal special purpose machines, checking layout, design, and fabrication of the cutting elements to be supplied with the delivered machines.

As each machine was completed, a pilot lot was run through the machine to prove the preliminary tooling decisions. Thus, when the machines were delivered and installed in the new plant they were ready for *immediate* production, with carbide tools setting the pace. Thus, production in those early stages was far higher than it would have been had not the carbide tooling program been inaugurated in advance of the plant's opening.

However, continuing operation of the control plan has resulted in further improvements in the tooling and performance of practically every machine in the plant, and probably will continue to do so.

Some time ago the Carboloy Company, Inc. announced the availability to industry of a "Coordinated Carbide Control" Program developed as the result of years of work with various manufacturers in the metal working industries.

How such a plan works in an actual plant is told in the accompanying story. It also points up, once more, the rapidly growing sphere of influence of the tool engineer in the industrial picture—extending his field of operations beyond the original 'tooling for production' and into the daily job of always looking for and applying new ways of improving product quality and reducing costs even after the product is put 'in production'.

Centralized Responsibility Promotes Unity in Action

As the coordinated carbide control program is set up at the Trenton Works, the carbide coordinator is held directly responsible to the chief planning engineer for the following major elements of the program:

1. Initiating improvements in cutting tools and related accessories;
2. Design of all cutting tools;
3. Specification of cutting material to be used on each operation;
4. Test runs to approve practicality of proposed tooling changes;
5. Follow-up on new carbide applications to make certain that specified tools are correctly applied.
6. Trouble shooting in case of tool breakage, high scrap, etc.

The carbide coordinator makes recommendations on speeds, feeds, and other operating factors to the planner assigned to the particular production area and responsible for machine performance and over-all tooling in that area. The coordinator also suggests changes in work and tool holding devices for improved tool performance or increased tool life.

Centralized Grinding

Since tool quality is essential to produce quality, all facilities for the brazing, grinding, and inspection of cutting tools have been centralized in one grinding room. This is conveniently located near the center of the production area, and adjacent to the tool crib.

Economies resulting from use of centralized grinding include such things as less grinding equipment needed, minimum number of trained grinder hands, greater savings in salvaged tools, longer tool life, negligible tool spoilage, and lowered tool maintenance costs.

Although the grinding room and its personnel are in the tool room foreman's jurisdiction, the carbide coordinator is directly responsible for standard procedures, techniques, and quality of work produced. Each of the 10 grinder hands

is assigned to keep certain production machines supplied with sharpened tools, both HSS and carbide.

Although three of the grinder hands had had previous experience with carbides, all ten men were given an intensive one-week course in brazing and grinding by Carboloy Company service engineers, two of whom spent a month in the new plant after it opened. Training has continued on an informal on-the-job basis. In addition, the group leader on the night shift has received advanced training at the Carboloy Customer Training School in Detroit.

All tools are ground to exact print specifications. No tool is ever ground to an operator's instructions, unless the area planner and the carbide coordinator decide to try his ideas on an experimental basis. Each grinder hand is responsible for the quality of his own work, and all tools pass a rigid inspection before leaving grinding. The carbide coordinator makes a 100 percent inspection on any "critical" tools, and spot checks all other tools.

When an operator returns a tool to the tool crib, the tool is transferred to the grinding room for inspection which includes a visual check for poor brazing, cracked tip, "bugged" shank, insufficient tip overhang, etc. This determines how much and what work is necessary to recondition that tool. When all necessary work is done, and tool has been finish ground to exact specifications, it is again inspected. After passing inspection, tools are dip-coated with ethyl-cellulose coating to insure that the ground-in precision will be retained until the tool is put into use.

Economies resulting from the centralization of all grinding activities and from related practices include:

1. Less grinding equipment, including diamond wheels, needed;
2. Elimination of unnecessary duplication in costly inspection devices;
3. Minimum number of trained grinder hands;
4. Greater savings in salvaged tools;
5. Lower tool maintenance costs;
6. Longer tool life; negligible tool spoilage; and elimination of production losses due to machine operator grinding his own tools.

Standard Tools Used Where Possible

In tooling for continuous production, many refinements are necessarily introduced into the design of cutting elements but without departing from the principles of standardization. For economy, for convenience of obtaining experimental tools, and for rapidity in putting tool changes to work, new tools are designed—whenever possible—so that they can be made up by modifying a standard tool or by utilizing a standard blank immediately available from reserve stock.

Among the benefits provided by maximum use of standard tools and standard blanks are:

1. Simplified tool specification and tool design;
2. Elimination of much waiting time for tools;
3. Tool inventories reduced;
4. Requisitioning, purchasing, and delivery of tools all speeded up;
5. Tool costs kept at a minimum.

The reserve tool stock maintained by the tool crib includes a small inventory of standard catalog tools. Tools drawn from this stock and modified to specific plant needs supply about 75 percent of all single point tools used. Usually, such modifications constitute minor grinding operations only.

When needed, tools that cannot be adapted from standards can often be made quickly and cheaply in the plant by using standard carbide blanks drawn from stock. These blanks are brazed either to salvaged tools or to special shanks or cutter bodies machined in the plant's main tool room.

Fig. 1. This automatic-cycle machine was designed especially for first-operation work on the GE automatic washer. Six operations are performed on the one machine in 52 seconds.

The tool crib stocks small quantities of standard carbide blanks in a wide range of sizes, shapes, and grades. These are in the plant ready for use when required for experimental or production tools, or as replacement tips on worn-out or damaged tools. Blanks arrive in the plant stamped with the grade number for ready identification in case they are separated and mixed with other grades. This identification helps insure the proper grade being used on any tool, at which time the latter is marked with the plant's tool number and the specified grade of carbide.

When special tools are purchased from an outside supplier, the test-proved carbide grade for the particular application is specified on the requisition and purchase order. If a standard blank can be incorporated in the design, its number is specified.

Tool Inventories Controlled by Single Distributing Point

Tools are stored in the central tool crib and are distributed from there. This permits smaller inventories, better inventory control, and fewer crib attendants. Carbide tools are separated into *reserve* and *active* stocks for efficient crib handling.

The *reserve* stock consists of standard carbide tools and standard blanks, as obtained from suppliers, and arranged according to their original catalog numbers. Tools drawn from this stock are charged out permanently against a particular machine.

The *active* stock consists of those tools drawn from reserve and designated for use on specific machines. These tools are usually modified by grinding before being added to the active stock. When modified, they are numbered by the grinder hand for quick, positive identification. Electro-etch is used for numbering to avoid tool damage or burs.

A typical plant tool number is:

846	7	1	905
(Machine)	(Station)	(Serial)	(Grade of Carbide)

Fig. 2. From the rough bearing frame casting at left, 2 lb, 6 oz of metal are removed in 10.4 minutes by a series of operations.

TOOL TROUBLE CHART

BARNES BEARING FRAME MACH. "B&B" — FROM NOV. 30 — TO DEC. 15

DAY	TOOL NUMBERS																			
	1-1	1-2	1-3	1-4	1-5	1-6	2-1	2-2	2-3	4-1	7-1	7-2	7-3	7-4	7-5	7-6	7-7	7-8	7-9	7-10
TUE.							✓				✓	✓			✓					✓
WED.			✓			✓		✓				✓	✓	✓						
THU.			✓					✓				✓								✓
FRI.												✓		✓	✓					
SAT.	✓	✓	✓			✓	✓	✓	✓	✓		✓								
MON.																				✓
TUE.			✓ ✓					✓ ✓				✓ ✓		✓						
WED.						✓						✓			✓					
THU.		✓													✓					
FRI.	✓		✓ ✓					✓				✓ ✓		✓						
SAT.																				
MON.								✓												
TUE.			✓		✓		✓	✓	✓	✓		✓								
WED.	✓		✓					✓						✓						

Fig. 3. A two-week tool trouble chart is kept by the bearing frame machine operator. Each time machine is stopped, operator scores chart under tool number representing source of trouble. Chart thus indicates where trouble is being experienced and what tools should be studied for possible revision.

The complete tool number tells (1) what machine the tool has been charged out against; (2) where, on the machine, it belongs, if used on a multi-tool layout; (3) what specific tool it is among several identical ones; and (4) grade of carbide.

Tools in active stock are stored according to the particular production machine for which they are intended. Some tools are boxed, especially when many different tools are required by one particular machine. Milling cutters, circular form tools, and others are usually hung on pegs to prevent striking one another with possible resultant damage to edges and surfaces. Some of the smaller tools—such as those for Heald Boremattics—are stored in drawer compartments.

Each grinder hand is responsible for maintaining an adequate active supply of tools for the machines he services. For operations requiring a large tool—such as a milling cutter—three identical tools are provided: one in the machine, one being re-ground, and one in the crib.

The stock crib gives a sharpened tool in exchange for a dull tool of the same number. No paperwork is involved.

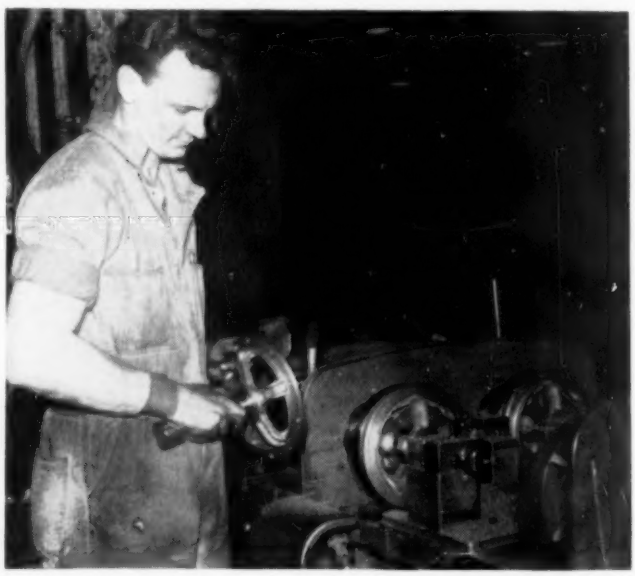


Fig. 4. Carbide tools on this 4-spindle machine have reduced second operation machining time on bearing frame to 43 sec per piece.

If a tool is broken or lost, operator fills out a broken tool replacement order, stating reason for damage, in order to draw a new tool. If he has other occasion to draw a tool without giving another in exchange, he signs a tool loan order. In either case, he is given his tool immediately from active stock. The broken tool replacement order indicates that a replacement tool must be drawn from the reserve supply, modified if necessary, numbered, and added to the active stock.

Inventory cards are filed in a visible record cabinet, where quick references can be made to the record on any item by running along the visible margins that carry only essential stock item identification.

Case Histories:

Calculation of over-all economies resulting from such a plan are practically impossible. The savings grow daily. A few examples of typical accomplishments, however, might be of interest.

One such is to be found in the W. F. & J. Barnes vertical 6-station automatic cycle machine (Fig. 1). This was designed specifically for first-operation work on the bearing frame—a vital part of the GE automatic washer—with close tolerance and concentricity requirements. Work comes direct to the machine as a fine quality grey iron casting (Fig. 2). Except for a few finish cuts, all operations on this complex part—facing, boring, chamfering, grooving, drilling, reaming, counter-boring, counter-sinking and tapping—are performed on this one machine in 52 seconds. A total of 2 lbs 6 oz of chips is removed from each workpiece by this series of operations.

The Barnes "bearing frame" machine features a 60 in. auto-indexed rotary table, with two settings at each station. At each indexing of the table, two workpieces are presented at the No. 1 (load and unload) station. From the second setting, the operator removes the workpiece which has been machined on both sides, replacing it by inverting the piece machined on one side and taken from the first setting, and chucks a rough casting for the first setting. Simultaneously, two pieces are being machined at each of the other 5 work stations.

The vertical 46-spindle head has a hydraulic, column-mounted feed, with separate motor drive for tapping units, and two auxiliary one-spindle horizontal units at the last work station. The rotary table is automatically indexed by a separate hydraulic unit. One 30 hp. motor—together with 5 small electric motors—furnish power for spindle speeds and automatic cycle controls. A separate motor is provided for a forced cooling system.

Feeds and speeds on the "bearing frame machine" are based on use of carbide single point tools. With three diameters required to be concentric to bore within 0.005 in. TIR (total indicator reading); three surfaces perpendicular to bore within 0.006 in. TIR; and two surfaces within 0.002 in. TIR, all single point tools used in taking these cuts must be precision ground beyond even normal requirements.

There are 25 single point carbide tools and 28 drills, reamers, taps, counterbores, in the Barnes machine. Each sharpened tool installed in the machine must be an exact duplicate of the dull tool it replaces. Since the operator—when changing tools—must be able to set them accurately against fixed stops without preliminary trial, he must be provided with tools on which the carbide tip is in perfect alignment with the shank; with cutting edges and angles in exact relation to the shank; and with the distance from the cutting edge to the butt end of the tool a constant, predetermined dimension. Only centralized grinding facilities can produce tools of this high standard.

With so many tools working simultaneously, down-time for re-setting or changing tools must be kept to an absolute minimum. So that engineers may concentrate on those tools causing a major percentage of the down-time, a tool trouble

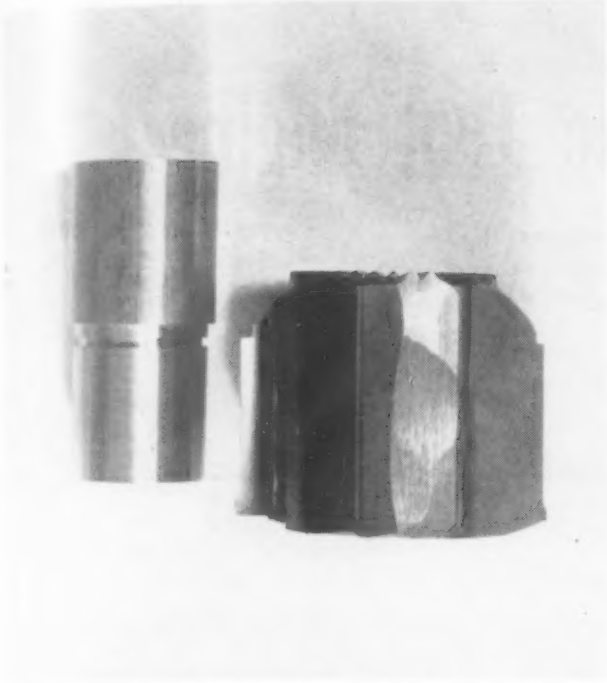


Fig. 5. This bellows head bearing, machined from Ampcaloy tubing, requires a circular form tool to rough minor diam to 1.075 in. About 0.0145 in. stock is left for finishing.

chart (Fig. 3) is maintained by the machine operator. The chart reveals frequency of machine stoppage due to any one tool. It also may show the influence of some external factor, as when a number of tools require attention at approximately the same time.

With 12 work pieces in the machine—and one complete piece being delivered about every 52 seconds—it is also *essential that tool troubles be anticipated*. This is accomplished by the quality engineers who maintain "range charts" on certain critical dimensions. These *spot* any variances in performance that indicate a potential source of trouble, such as dulling of tools or loosening of holding devices. Fluctuating performance is immediately called to the attention of the operator and his foreman, enabling trouble to be checked *before* it can result in inspection rejects.

The second operation on the bearing frame is performed on the precision bore-and-turn machine shown in Fig. 4. On this 4-spindle automatic-cycle machine, two pieces are machined simultaneously while pieces on the other two spindles are being unloaded and loaded in pneumatic chucks. Using carbide-tipped tools, machining takes 43 sec per piece.

"Suggestion Box" Ties in with Plan

Although the special purpose machines were designed for use with carbides, many of the standard lathes as well as precision boring machines and automatic screw machines were initially tooled with HSS tools. Today, however, most of these jobs have been converted to carbide tooling and those not yet changed are on schedule for conversion.

Occasionally, operators or grinders anticipate engineers on the subject of conversion to carbides by means of the plant's suggestion box. Such was the case in the production of the bellows head bearing (Fig. 5). The bellows head bearing is machined from Ampcaloy 783 tubing on an Acme-Gridley automatic. Operation requires a circular form tool to rough minor diameter to 1.075 in., leaving 0.015 in. stock for finishing; chamfer corner 1/32 in. x 45 deg; and square shoulder to length of 1.250 in.

Life of the HSS circular form tools originally specified on this job was exceedingly short, the tools having to be changed on an average of 5 times each 8-hour shift. The tool grinder suggested that a scrapped HSS circular form tool be tipped with Carboloy grade 44A, and prophesied that such a tool would outlast the HSS ones 3 to 1. The tool was made up as suggested. After running more than 10 days without being taken from the machine, the tool was accepted and tool specifications and production standards properly revised.

Another example of a single tooling improvement resulting in important savings was the introduction of a single step cutter in the finishing of two ends of a drive tube bore. The drive tube was both rough and finish bored from SAE 1020 seamless tubing on a special W. F. & J. Barnes horizontal 3-station machine.

Cylindrical-ground tubes are automatically centered and positioned from a central milled keyway, permitting both ends of 2 tubes to be bored simultaneously for a short distance. At Station No. 1, two tubes are rough bored on the ID. At Station No. 2, they are finish bored on the ID to 0.788 in., with tolerances of ±0.000 in. and —.0013 in.; and to a depth of 1-7/32 in. at one end and 1-1/32 in. at the other end, both with tolerances of +1/16 in. and —0 in. (opposite bores to be concentric within 0.004 in. TIR). At Station No. 3, parts are unloaded and loaded. Both rough and finish boring was originally done with solid carbide single point tools. However, an additional and costly burring operation was necessary to remove burrs left by original scale at the bottom of the bore.

It was suggested that a special carbide-tipped multi-step cutter (Fig. 6) can be substituted at Station No. 2. This is a self-burring tool that produces 45 deg bottom and top corner chamfers, as well as holding the ID and depth accurately to size.

Use of this carbide-tipped multi-step cutter has made available for other work the two employees required on the costly hand operation to remove the burrs formerly left by scale at the bottom of the bore. Machining time on this operation is better than 43 seconds per piece. Tools are changed once each 8-hour shift.

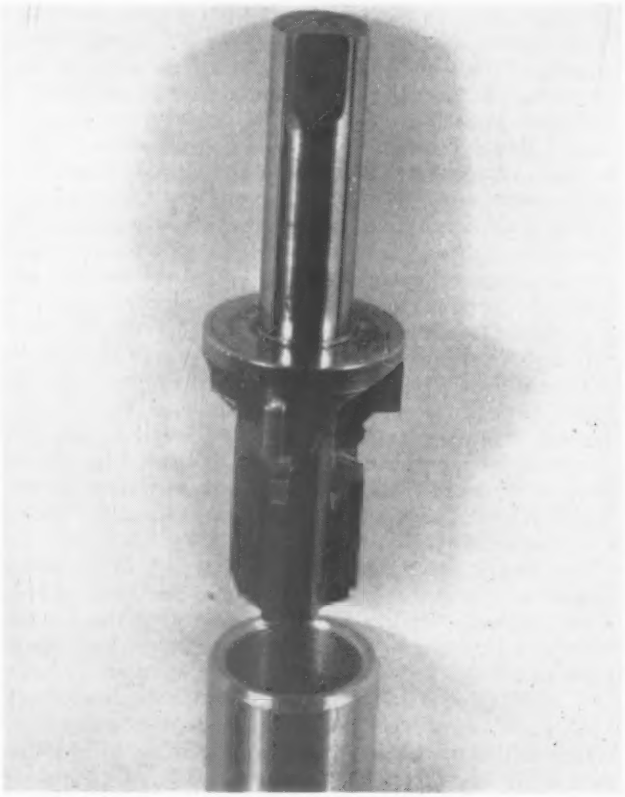


Fig. 6. Carbide-tipped cutter shown above has made available for other work two employes originally required for hand removal of burrs left by scale at bottom of drive tube bores.

Standards and the Tool Engineer

By L. B. Bellamy

CHAIRMAN, NATIONAL STANDARDS COMMITTEE
AMERICAN SOCIETY OF TOOL ENGINEERS

THE TOOL ENGINEER has a manifold interest in the standardization program of his company, his industry and his profession. Standards for the equipment, method of manufacture and inspection of the product are of prime importance to the tool engineer. Standards for the safety of the employees, floor loads, storage of material, machine guards, conveyor design, sanitation, crane and hoist capacities, safety clothing and other operational hazards are just a few of the codes that the tool engineer should be familiar with and have a part in formulating.

The establishment of standards for turning, boring, facing, grooving and threading tools, milling cutters, dill, reamers, jig and fixture components, clamps vises, machine finishes, plug and ring gages, gage blocks, snap gages, micrometers, dial indicators are but a few of the many items we daily use that lend themselves readily to standardization. In order to have utmost productivity at lowest cost, these standard economies must be realized.

Serving as a central, nationwide clearinghouse for the adoption of national standards is the American Standards Association. Through ASA, ASTE and other technical societies develop their standards in consultation with a broad representation of American engineering and industry.

The American Standards Association now consists of 112 trade associations, technical societies, government departments, consumer organizations, with 2100 corporations affiliated as company members. It has approved over 3000 American Standards and American Standard Safety Codes, representing the work of some 650 organizations with over 3500 members of the various technical committees. Management, labor, government and the consumer work together through ASA to develop mutually satisfactory standards. All activities are voluntary and are motivated by common need and interest. ASA's fundamental purpose is to serve industry by unifying and coding policy and practice through clear usable standards.

Our own society plays an important part in the overall pattern of standardization. According to our constitution all standards activities are the responsibility of the National Standards Committee. While for many years it was believed that we could successfully pursue our own path of issuing and establishing Tool Engineering Standards, however, by 1940, E. W. Ernst, then National Standards Chairman, and his committee re-examined our position and voted to affiliate with ASA. The first project, known as B-52, was the standardization of materials for tools, fixtures and gages.

Much detail and committee work had been initiated on various standards when the government suspended all activity for the duration of the war. The National Standards Committee remained inactive until 1945 when under the Chairmanship of W. H. Smila, reorganization was effected and once again an active program of standardization began. Continuation of our association and coordinating of our activities through ASA was also a part of the program.

Since we are a member body of ASA we are entitled to representation on all standardization work either in progress or in development which is pertinent to our technical field. Therefore, we have taken an active part in the standardization work of ASA, and the following list includes ASTE representatives on the various ASA sectional and technical committees.

B3 Standardization of Ball and Roller Bearings

ASTE Representative: R. M. Place, Toledo, Ohio.
The accomplishment of this committee has been the development of an American Standard known as B3.4/1—Gaging Practices for Ball and Roller Bearings. Through the International Standards Organization the sectional committee sponsors a technical committee known as ISO/TC4—Standardization of Ball and Roller Bearings.

B4 Allowances and Tolerances for Cylindrical Parts and Limit Gages

ASTE Representative: G. H. Stimpson, Greenfield, Mass.
The formation of this sectional committee under ASA procedure was started some 20 years ago. However, their activities have been more or less in the development stage. All activities on this project were suspended during the war and recently a notification was being re-activated.

B5 Standardization of Small Tools and Machine Tool Elements

ASTE Representative: C. H. Borneman, Schenectady, New York.
This is perhaps one of the most active committees organized under ASA procedure in the mechanical field, and was formulated some 25 years ago. There are many sub-committees as well as technical committees working under the sectional committee, and ASTE is represented as follows:

B5.20 Machine Pins

ASTE Representative: Adam Gabriel, Chicago, Ill. (Approved Standard).

B5.6 Jig Bushings

ASTE Representative: Adam Gabriel, Chicago, Ill. (Approved Standard).
This committee has been quite active for a number of years. Recently a revised standard on jig bushings was published and approved and is now available through ASA.

B5.T9 Punch Press Tools

ASTE Representative: J. I. Karash, Cleveland, Ohio.
This technical committee was recently organized and is in the process of developing a standard.

B5.T21 Tool Life Tests for Single Point Tools

ASTE Representative: M. F. Judkins, McKeesport, Penna.
Standard now in developmental stage.

B6 Gears

ASTE Representative: P. Lindhuber, Toledo, Ohio.
This committee has been active and has recently published an approved American Standard known as B6.5—Letter Symbols for Gear Engineering.

B17 Standards for Shafting

ASTE Representative: J. C. Brenner, New York, N. Y.
Sectional committee organized approximately 10 years ago. Dormant during the recent war and has recently been re-organized and re-activated.

B46 Classification and Designation of Surface Qualities

ASTE Representative: A. Gabriel, Chicago, Ill.; A. M. Swigert, Dearborn, Michigan; R. Waindle, Aurora, Ill.
Last approved American Standard was published in 1947 and known as B46.1—Surface Roughness Waviness and Lay. Projects now in the process of development are:

(1) Preparation of standard for Surface Roughness Specimens in their present state of art.

(2) Preparation of two standards, one covering ruled specimens as master standards and the other on machined specimens as secondary standards.

B52 Classification of Materials for Tools, Fixtures, and Gages

Sponsor: ASTE.
Committee re-activated and reorganized after 10 years dormancy. A. M. Swigert, Chairman. Sectional committee meeting held in September, 1949, and steering committee appointed to review scope of project and formulate a "program of work." At another meeting, held January 24, 1950, the program was prepared for submission to the sectional committee.

Z14 Drafting and Drawing Room Practices

ASTE Representative: J. L. Kemp, South Bend, Indiana.
American Standard published in 1946 known as Drawing and Drafting Room Practice. Mr. Kemp, ASTE representative to Z14 Sectional Committee, is also the chairman of a subcommittee known as Z14.1—Tool Drafting Practices. This committee was recently organized and is in the process of developing a standard.

Additional representatives to other committees are being appointed as the need occurs and various standardization projects are initiated.

The ASTE National Standards Committee chairman is the representative of the Society on the American Standards Association Standards Council and takes an active part in their meetings and deliberations.

Practical standards do not constitute a panacea for all our ills. We endeavor not to be too idealistic in our approach to the many problems that confront us. Standards are developed only as they provide or expect to provide an economic gain, and they serve little purpose unless they pass this test.

We have all experienced difficulties with materials and components, with ideas and human weaknesses and enthusiasm and we should learn to recognize the limitations that can be accomplished by promulgating a standard as the solution of these ills.

Practical standards are not necessarily unanimous, in fact unanimity should not be expected but rather suspected as a weakness. However, a majority can reach a conclusion and compromise on the original concept.

Standards should never be compulsory. They acquire their acceptance by usage and custom, although initially some education and sales effort is required to emphasize the standards excellence. Of course, legally established standards such as weight, length, temperature, are an exception to our way of establishing standards.

Many of our standards that are in daily use were not formally developed; they were adopted by common consent and mutual custom. Practical standardization is not complete, it is not final. As with all human things, errors are made, changes take place; all of which necessitate correction in the standard. We should never be so detailed or simplified in the development of a standard so that elimination of variety and selection of components are affected.

Standardization is a tool which we should use to move forward together towards greater efficiency and higher productivity.

Published standards of the American Standards Association have contributed to engineering progress in all phases of industry.

Pre-Shave Gear Cutting Tools

By A. D. Moncrieff

ASSISTANT CHIEF ENGINEER
MICHIGAN TOOL COMPANY

WHERE GEAR CUTTING—whether by hobbing, shaping, or by the shear speed method—is to be followed by gear shaving, it is desirable that pre-shave tools, rather than standard tools, be used if the best results are to be obtained.

The difference between a pre-shave tool and a standard tool is that the former takes into account the location and the amount of stock to be removed by shaving, and insures a smoothly blended tooth profile.

The design of the pre-shave tool varies according to:

1. Number of teeth in gear
2. Diametral pitch
3. Pressure angle

The reason for this is that the smaller the number of teeth, the more undercut will be produced by a "standard" tool. Diametral pitch controls the amount of tool modification required to provide clearance for the shaving cutter. The pressure angle determines the location and amount of tool modification.

Fig. 1 shows nomenclature used in connection with pre-shave hobs and shaper cutters. To understand the reason for the protuberances and the specialized design problems in pre-shaving tools, it is necessary to review briefly what happens when a gear is subsequently shaved.

The shaving cutter cannot, by nature, remove stock over the entire contour of the tooth space. The objective of modifying the design of pre-shave gear cutting tools is to obtain a smoothly blended profile *after* the gear is shaved. If a *standard* gear cutter is using prior to shaving, the result will be either an undercut with a sharp break at the fillet, or a step where the shaving cutter has undercut the profile left by the pre-shave tool. The result will be an inaccurately shaved gear and low shaving cutter tool life.

The dotted line in Fig. 2 paralleling the involute indicates, in exaggerated form, the stock removed by shaving. It will be noted that the last point of contact of the mating gear is above the last point of contact of the shaving cutter. It is at this latter point where the step or break would occur.

There has thus been considerable difference of opinion as to the desirability or necessity of protuberances on pre-shave gear cutting tools. Some manufacturers disagree with their use, claiming that the protuberances result in a reduction of tool life.

The alternative recommended is to add a cap with a generous radius to the addendum of the standard hob tooth and so design this hob that the extra addendum will, by its deeper sweep, provide the desired clearance. It is our belief that the alternative suggestion offers only a partial solution. We feel that an extra addendum added to the hob tooth is useful only for a limited range of gears.

On 14½ deg P.A. gears, the range is from 13 to 30 teeth. For this range of teeth there is a natural undercut at the fillet and an added addendum on the hob tooth is effective for such gears. For the ranges of gears mentioned, we believe the protuberances are not needed, however, for this range we use a pre-shave addendum of 1.35 divided by the diametral pitch.

Another point to remember in this connection is that it is becoming more common, in modern gear design, for the pinion to be made oversize, thus avoiding the undercut which inevitably weakens the tooth. For undersized gears it is necessary to give special consideration to the design of tools.

Fig. 3 shows the standard design used by Michigan Tool Company for 14½ deg P.A. pre-shave hobs, for cutting gears with 30 teeth and over. A similar standard design is

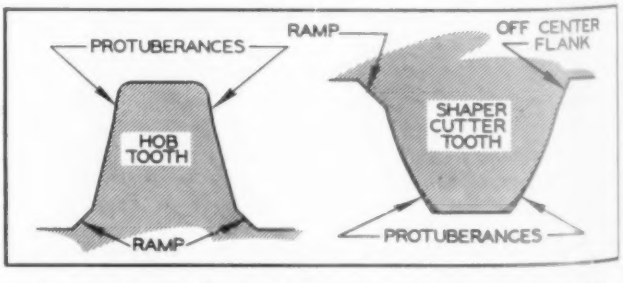


Fig. 1. Nomenclature used in connection with pre-shave hobs and shaper cutters is illustrated in the sketches above.

From a paper presented before the Chicago Chapter, ASTE.

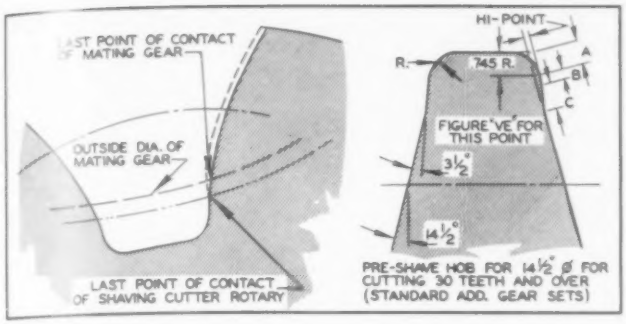


Fig. 2. (left). The dotted line here paralleling the involute indicates the stock removed by shaving. Fig. 3 (rgiht) illustrates a design for 14½ deg P. A. pre-shave hobs, for cutting gears with 30 or more teeth.

used for 20 deg P.A. gears. In the design of this hob, a radius is tangent to the short protuberance marked *B*. This short protuberance extends to join the portion of the tooth indicated by dimension *C*.

Such a design does much to compensate for the lower clearance angle on the protuberance, the prime factor to be considered in connection with the tool life of protuberance hobs. In developing this design, we were aware of the danger of decreasing tool life by adding too much protuberance since this would tend to lower more and more the side clearance angle of the hob at this point.

The standard design used now is the result of extensive layouts and studies of performance records of many protuberance hobs. A prime factor in the design is that we use more back-off cam when relieving protuberance hobs. In this manner we give protuberance *B* sufficient side clearance, and since *B* protudes furthest, it will by nature cut sufficient clearance to protect dimension *C*. With this design, performance records have shown that hob life will compare favorably with standard hobs.

Hob Mounting

In general, there are three types of mounting eccentricity: (1) when both ends run out the same amount in the same direction. (2) eccentricity at one end only. (3) eccentricity at both ends, with the high point of the runout occurring anywhere on the periphery.

Fig. 4 shows what happens when both ends run out in the same direction and indicates the type of tooth errors which will be produced at different positions on the periphery of the hob. The amount of the error transmitted to the gear, of course, depends on the relative setting position between the hob and the gear, and also on the P.A. and the number of gashes on the hob.

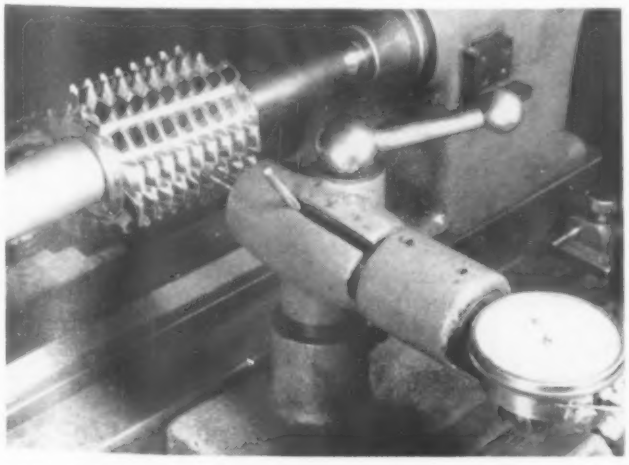


Fig. 6. Typical gear and hob checking fixture setup.

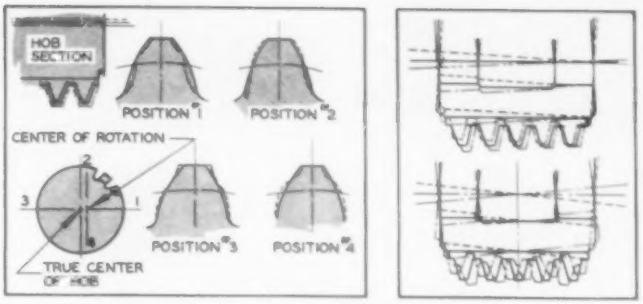


Fig. 4 (left) shows the results of both ends running out in the same direction. The types of errors which will occur at various positions on the periphery of the hob are shown. Fig. 5 (right). At top is shown the effect of concentricity at one end only, and at the bottom the effect of concentricity at both ends.

Fig. 5 shows at the top, the effect of eccentricity at one end only and below, the effect of opposed eccentricity at both ends. The errors produced are just as serious as the previous example. The main difference is that in the case illustrated in Fig. 4, the hob will give the same errors at different settings across the hob. The amount of error in the two cases shown in Fig. 5 will change with each different axial setting.

It should also be remembered that the hob must be mounted true on the hob sharpening machine since any mounting error on the hob sharpening machine will result in errors transmitted to the gear. As a matter of fact, errors in the hob caused by sharpening can easily multiply in case the hob is mounted on the hobbing machine in such a way that the runout adds to the error introduced by grinding.

Fixtures Aid Accuracy

Another type of error can be introduced by incorrect grinding of the lead in the hob. This will result in a leaning condition in the gear tooth. To prevent such an error in the lead of the gash, the simplest procedure is to indicate the OD from one end of the hob to the other. Similarly, runout and spacing of the gashes can be checked by rotating the hob. Universal gear and hob checking fixtures are readily available for such work. One type is shown in Fig. 6.

The effect of unequal gash spacing is to produce errors in the tooth profile. The solid line shown in Fig. 7 represents the true position of equally spaced gashes. Unequally spaced gashes will produce the errors shown in dotted lines. The error at point 5 is caused by a gash ahead of center, since this will cut away a portion of the tooth form. When a gash is behind center—and arrives late—it leaves excess stock, as shown at point 3.

If a hob is ground in such a manner that a hook or posi-

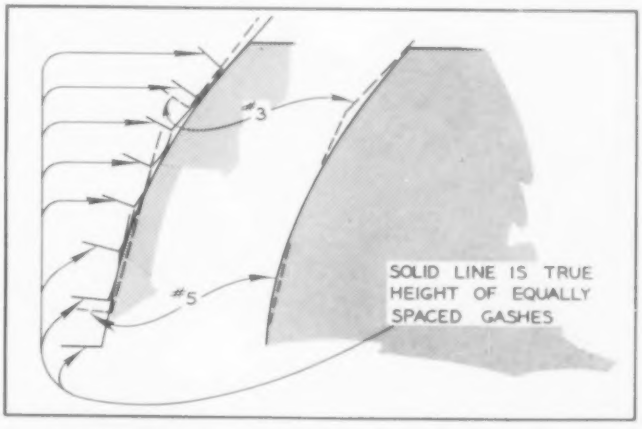


Fig. 7. Unequal gash spacing produces errors in the tooth profile. The black line represents the true position of equally-spaced gashes. Dotted lines indicate the errors produced by unequally-spaced gashes.

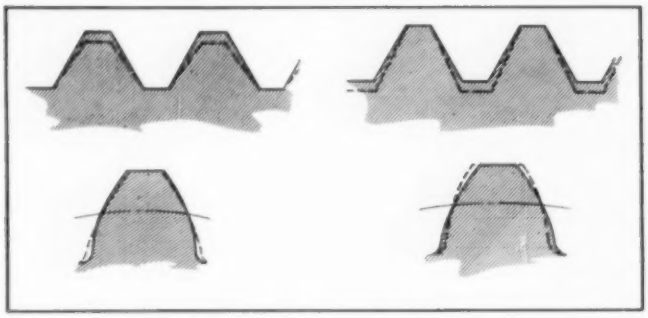


Fig. 8 (left). This gear tooth form is the result of grinding the hob in such a manner that a hook or positive rake is produced. At right is a tooth form with a larger pressure angle—the result of sharpening a hob with a negatvie rake.

tive rake is produced, the result will be a gear tooth form having a small P.A. as shown at left in Fig. 8. Conversely, when a hob is sharpened with a negative rake, it will cut a tooth form having a larger pressure angle as shown at right in Fig. 8.

Pre-shave Shaper Cutters

In general the same remarks hold true for shaper cutters as for pre-shave hobs. Beyond a limited range of gears, protuberances are required and for the same reason. It is also just as important to mount and grind the shaper cutter correctly. To assure correct grinding, the OD of the cutter and its back face should be used as indicator reference points.

There is some difference, however, in the amount of addendum required on shaper cutters, as compared with hobs.

For comparison Fig. 9 shows gear teeth generated by both a shaper cutter and hob having the same addendum. By providing an additional addendum on the shaper cutter, we can produce a fillet similar to that produced by the hob. The diameter of the shaper cutter, of course, will affect the shape of the fillet.

In general, a shaper cutter with a standard addendum of 1.25 divided by the diametral pitch will produce a fillet similar to that cut by a hob with an addendum of 1.157 over DP. If a protuberance is added to an addendum of 1.4 over DP an adequate undercut to allow for stock removal by the shaving cutter is produced.

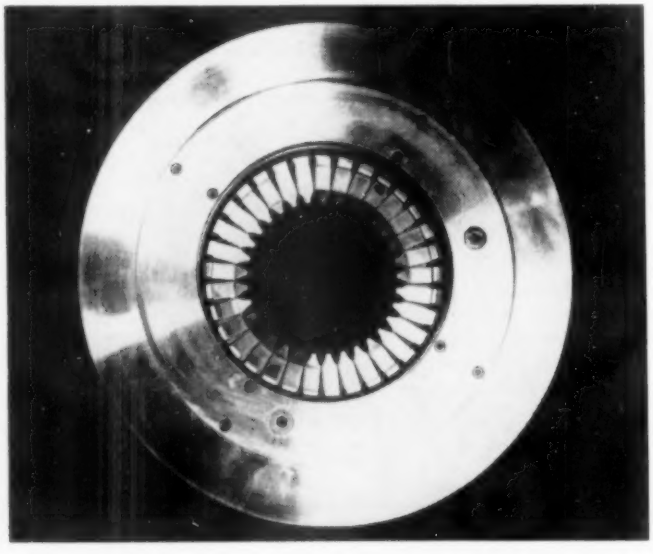


Fig. 11. This tool head, used in the shear-speed technique, locates the tools in correct position to form the teeth.

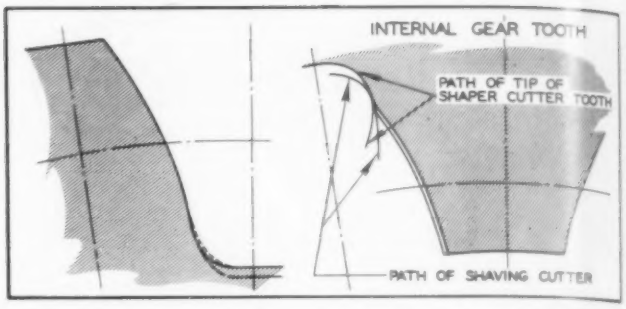


Fig. 9 (left) is a gear tooth form generated by both a shaper cutter and hob having the same addendum. Fig. 10 shows the results when a protuberance shaper cutter is used to cut internal gear teeth which are to be shaved later. The outline of the tooth as shaper cut is shown by tracing the extreme edge of the tooth form.

Fig. 10 shows the results when a protuberance shaper cutter is used to cut internal gear teeth which are to be shaved later. The outline of the tooth as shaper cut is shown by tracing the extreme edge of the tooth form. Notice that the path of the shaving cutter blends smoothly with the undercut produced by the shaper-cutter.

Pre-shave Tools

We now come to the third gear cutting method, involving somewhat different problems. Whereas hobs and shaper cutters are generating tools, the shear speed process operates on the principle of gear forming.

In this technique the same number of tools are required as there are teeth to be cut in the gear. The tools are arranged in a tool head (Fig. 11) which locates them in correct position to form the teeth.

The tool head, therefore, provides the required correct spacing of the gear teeth and to a certain degree also controls eccentricity of the gear. Other elements of gear accuracy are controlled by the tools themselves.

Fig. 12 is a view looking from the floor up into the cutter head, mounted on the machine. The gear has just been cut and the cutter head has moved upward so the gear can be removed from the arbor. When in cutting position, the head is down against the stop and completely surrounds the gear.

To control eccentricity not caused by cumulative tooth spacing, the work adaptor can be shifted in relation to the feed cone. Usually, this operation is not necessary in actual practice because once the pilot diameter for the work adaptor is correctly indicated with the feed cone, it will not change.

So as not to confuse cumulative tooth spacing errors with an accumulative spacing error caused by eccentricity, the usual procedure is to indicate the feed cone first. This is done by an indicator attachment which locates from the locating surfaces and diameter of the work adaptor to sweep indicate the feed cone with the tool head removed.

Action Reversed for Internal Gears

For cutting internal gears (Fig. 13) the action of the feed cone and retractor cone is reversed from those used to cut external gears. The feed cone backs up the tools and is stationary during the cut. At the finish of the cutting portion of the stroke retractor, the retractor cone moves upward moving the tools away from the gear to avoid drag while the gear returns to its starting position. Before starting the next cutting stroke, the tools are fed inward by the feed cone. As for external gears, this action continues until the gear is cut to size. Average in feed is about 0.005 in.

If the tools are not located correctly in relationship to radial centerlines of the gear, incorrect tooth spacing will result. This condition, if encountered, can be corrected by shifting the tool head. Illustrated here in Fig. 14 is a chart A of tooth spacing of a gear which is within limits for teeth

Fig. 12. Above is a view looking from the floor up into the cutter head. The gear has just been cut and the cutter head has moved upward so that the gear can be removed from the arbor.

spacing. Irregular spacing causes additional tooth kick in portions of the gear. This condition is rectified by shifting the tool head and the results of moving the tool head are shown by a second set of charts. Note that chart *B* for concentricity now shows a uniform tooth jump around the circumference of the gear, and that, the amount of runout is decreased.

Fig. 15 shows the manner in which a definite involute form is produced at a given tooth thickness. The tool and the gear tooth are shown on the same centerline. Note how the form changes as the tool is fed toward the center of the gear.

Because of this condition, it is important that the correct size for the gear be maintained. If the gear is cut undersize, the involute form will be minus at the tip of the tooth. Conversely, if the gear is left oversize, the tip of the tooth will be high, showing a plus involute condition.

To design these tools, a layout is made as in Fig. 16 showing the outline of the finished gear tooth to obtain the required dimensions over pins. The fillet is omitted, merely drawing the tooth to the base circle diameter.

A. The next step is to add a fillet such as would be generated by a hob or shaper cutter.

B. We then lay in a second involute line parallel to the tooth and approximately 0.0015 in. away. This represents the shaving stock allowance.

C. The diameter where the first contact of the mating gear occurs on the involute profile is added. As we are concerned with the shaving cutter, we insert the diameter at which the first contact of the shaving cutter occurs, as well as the path formed by the sweep of the tip of the shaving cutter.

We can now study the position and amount of undercut required for the shaving cutter, keeping in mind that it is necessary to have adequate side clearance for the tool to avoid drag on the return stroke. This limits the angle at the undercut portion of the tool to not less than 9 deg with the center line. Usually there is no difficulty in obtaining this condition. However, there are some exceptions in the case of 14½ deg P.A. gears, in which case, another procedure is used.

Fig. 17 illustrates a second method of providing undercut for the shaving tool. This procedure is used when the minimum P.A. used on the tool would trim away too much of the involute. The steps in laying out the tool are identical with the previously illustrated method, except for the design of the clearance angle. This portion of the tool is designed, in this case, by continuing the involute profile down the tool to a point immediately above the last point of contact of the shaving cutter. At this point the involute is connected to a negative angle to form the protuberance on the tool as shown. The negative angle has no side clearance but is protected by the proturbance as for hobs and shaper cutters.

Smooth Profile After Shaving

Thus, in each design, a portion of the involute profile was removed to provide clearance for the shaving cutter. When a gear cut in this manner is rolled with a master gear before shaving, it will roll rough because tooth action is not continuous. However, as illustrated here, a smooth full involute profile is regained after shaving as shown in both Figs. 16 and 17.

For sharpening shear-speed tools a standard type tool room surface grinder may be used. The fixture usually involves a magnetic chuck on which the tools are placed. To sharpen the tools, a single surface, the face of the tools is ground. The magnetic chuck is inclined to the correct angle and locked in this position while the blades are

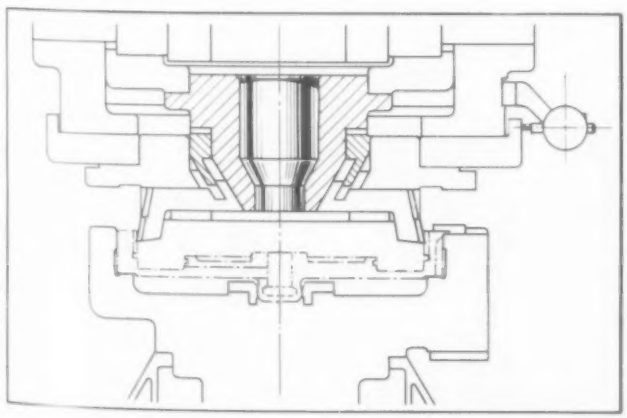


Fig. 13. As shown here, the action of the feed cone and the retractor cone is reversed in cutting internal gears. Feed cones back up the work during the cut, then retractor cone moves upward to move tools away from the gear, preventing drag while gear returns to starting position.

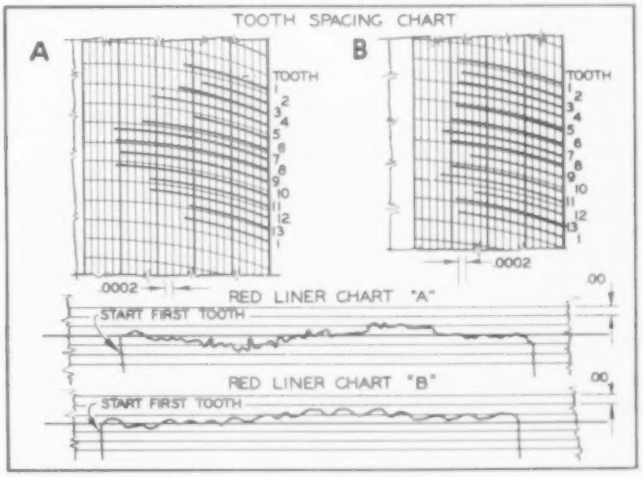
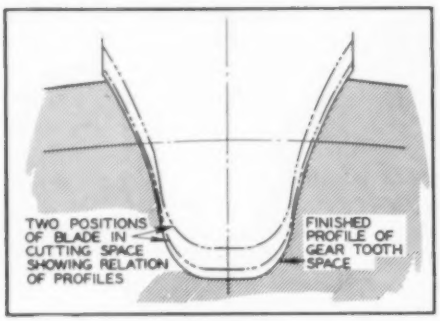
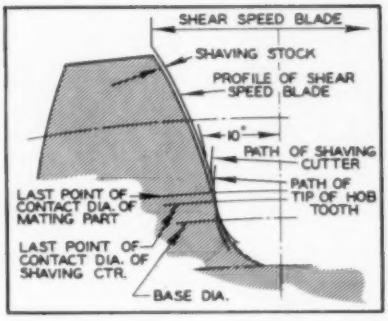


Fig. 14. Chart A here indicates tooth spacing of a gear which is within limits for concentricity, but is outside the limits for tooth spacing. Irregular spacing causes additional tooth kick in portions of the gear. After shifting tool head, results are shown in Chart B, where tooth spacing is uniform.





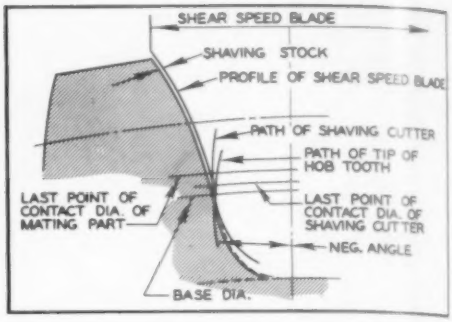


Fig. 15 (left) illustrates the production of a definite involute form at a given tooth thickness. In Fig. 16 (center) is shown a layout made to indciate the outline of the finished gear tooth to obtain the required dimensions over pins. A second method of providing undercut for the shaving tool is shown in Fig. 17 (right). Layout is similar to Fig. 16, except for clearance angle; involute profile is continued down the tool to just above the last contact point of shaving cutter. Here the protuberance is formed.

sharpened. The same care must be taken in sharpening these tools as is exercised in sharpening shaper cutters or hobs. If the correct angle is sharpened in the tools, they will produce a gear with correct involute form.

Other errors can be introduced if all tools are not the same height, so care must be taken that they are clean and located snug against the parallel edge of the fixture that contacts the tail of the tool, and, of course, it is necessary to sharpen each tool uniformly with the next so they will be the same height from their back surface.

Selection of Gear Steels

As the cutting tools for gear teeth are more costly than turning tools, we believe it is economical to favor them wherever possible in selecting gear steels as to grain structure and hardness.

When referring to gear steels, we think of carburizing steels SAE 4027-4620-3220 and through-hardening steels SAE 1050-1045-8640-5145-4340 and other similar steels. While SAE 1050-1045 are referred to as through-hardening steels, we realize they are not hardened through when they are used for induction hardening. We have found carburizing steels machine better when they are not dead soft.

Fig 18a is a photo-micrograph of SAE 4027 gear steel. This is a reproduction of 300 times size photo-micrograph. The structure of pearlite and blocks of ferrite is obtained by heating to above the transformation point (1450 deg F) and cooling at a constant rate in a production-type furnace. This method is used extensively for carburizing steels and the resulting hardness and grain structure machines well.

For through-hardening steels it is common to find the same annealing process followed with the resulting pearlitic grain structure as shown in Fig 18b a photo-micrograph 500 times size of SAE 5150 steel. Along with this structure the annealing process produces hardness from 190 to 230 Bhn. which is higher than desired for best machinability.

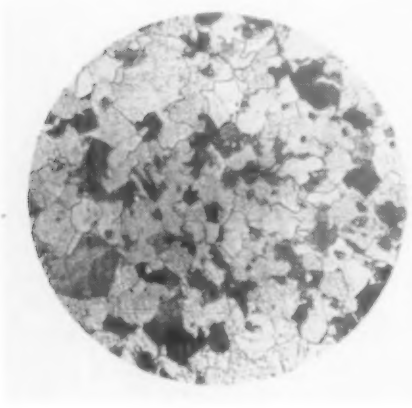
Alternative Annealing Method

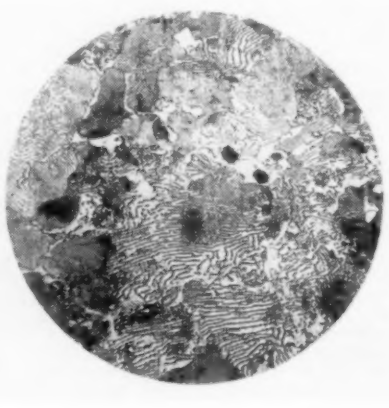
An alternative method of annealing is suggested to obtain a desired Bhn between 170-190. While the length of time required for annealing is, of course, dependent on the size of the gear, the following cycle has worked well for gears used in light truck transmissions and tractor transmissions.

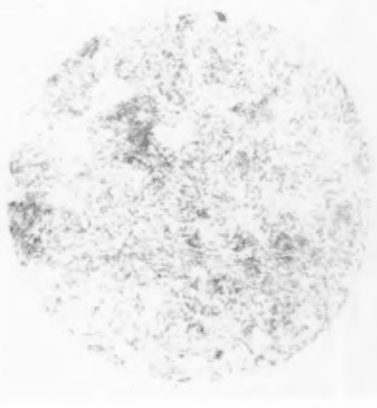
In Fig. 18C is shown a photo-micrograph 1000 times size of SAE 8645. We have found it desirable to produce a spheroidized structure, but to maintain a hardness in the range of 170-190 Bhn.

The gear steel is heated above the transformation point then lowered to just below transformation point, held for a period of three hours and then cooled to room temperature. In this instance the annealing cycle takes no more time than that required by the replaced anneal cycle. But we attained a much higher degree of machinability increasing tool life, for example, from 150 pieces per sharpening to 350 pieces per sharpening. In checking back on turning operations, we found the various required tools were making more pieces than previously, but we have no accurate report of their tool life.

Fig. 18a (left). Photo-micrograph of SAE 4027; mag 300x. Pearlite mixed with ferrite is obtained by heating to 1450 deg F, then cooling as a constant rate. This method is commonly used with carburizing steels. Fig. 18b (center) is a micrograph of SAE 5150, 500x. This is a through-hardening steel, given the same anneal. Hardness is 190-230 Bhn. A suggested method for obtaining a hardness of 170-190 Bhn (Fig. 18c, right) involves heating the steel (SAE 8645) to just above the transformation point, holding it below the transformation point for about three hours, then cooling to room temperature. Tool life increased considerably.







The Broadening Applications of Flexible Tooling

By Ernest A. Moore
VICE PRESIDENT
STAINLESS STEEL PRODUCTS, INC.

"Flexible tooling," in the lexicon of current West Coast engineering personnel, comprises tools which can be quickly and economically altered or replaced in both short and long-run production operations. Such tools are briefly characterized by the following qualities:

(1) Ability to amortize their own cost when only a small number of parts have been manufactured therewith.

(2) Dimensional stability and accuracy enough to permit the fabrication of interchangeable parts, when necessary.

(3) Structural characteristics which accelerate the process of tooling up, thus minimizing the time that must elapse before a new design can be used in actual production work.

Flexible tools are not necessarily long-lived, if compared with other types of tools used in mass-production work. Yet they have saved untold thousands of dollars in large-scale production, as well as in limited manufacturing operations, by permitting the manufacture of prototypes with increased efficiency and by allowing final production work to begin many weeks or many months before the more permanent types of tooling were available.

Further, it has been found that in some types of intermediate production identical flexible tools may be replaced two or more times before a project is complete for less than the cost of permanent production tools and without a determinable loss in terms of production efficiency.

Specific examples of the flexible tools that are now available include:

1. Cast-alloy dies for gravity drophammers.
2. Rubber blankets and wood or Masonite form blocks for hydraulic presses.
3. Standardized production dies for press brake.
4. Friction-saw equipment for trimming operations.

The first of the above-named types of tools has been most prominent in the writer's experience, and will be discussed with more details in the remainder of this article as an illustration of the advantages of all flexible tools.

In essence, the process of fabricating cast-alloy dies for rope or gravity drophammers was initially developed to facilitate the production of streamlined aircraft parts during World War II. It involves the following general sequence of operations:

1. Patterns are produced, either as original models made with contour templates or as plaster splash-casts taken from parts mockups.

2. Plaster patterns are sealed by coating with lacquer or shellac, and used to make open-type sand molds.

3. The latter molds are used in the "green" condition to make tooling casts for dies with alloys such as Kirksite "A" and antimonial lead.

4. Dies are finished with flexible-shaft grinders by means of bluing blocks.

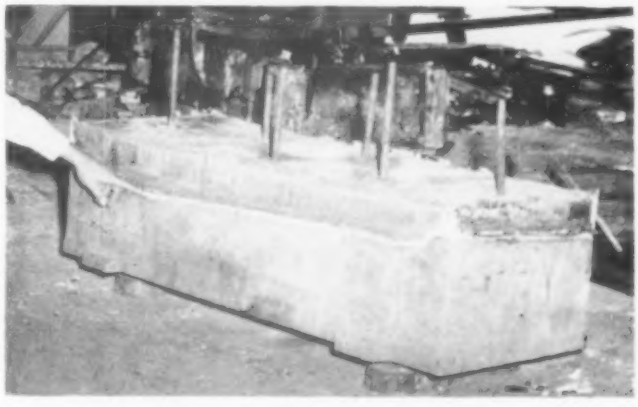
5. Each die is shielded with a refractory strip coating, equipped with a wood retaining wall or flask, and used as a mold for casting a mating punch with one of the previously-mentioned alloys.

6. Punches are finish-ground, the same as dies, and mating tools are set up for production.

By means of this procedure, new parts can be in production within ten days after they are designed. Less than a dozen and more than 5000 duplicate stampings have been made with the dies before replacement tooling was required.

Stamped materials have ranged from the lightest and most ductile types of aluminum-alloy sheets to the hardest and strongest specimens of steel and "superalloys" which had as much as 3/4 in. thickness. Heavy-gage stock is often preheated and handled with forging tongs so that it can be stamped at temperatures of as much as 2000 deg F without rupture and without damage to punches or dies which have much lower melting points.

The cast-alloy tooling has been used with particular success in the manufacture of combustion chambers and related



An antimonial lead punch positioned on a mating Kirksite drophammer die, as cast. Flask retaining walls have been removed from the die so that the refractory "parting line" between punch and die can be seen.

Marks made by an overhead "bluing block" are removed from this low-cost gravity drophammer die with a flexible-shaft grinder.

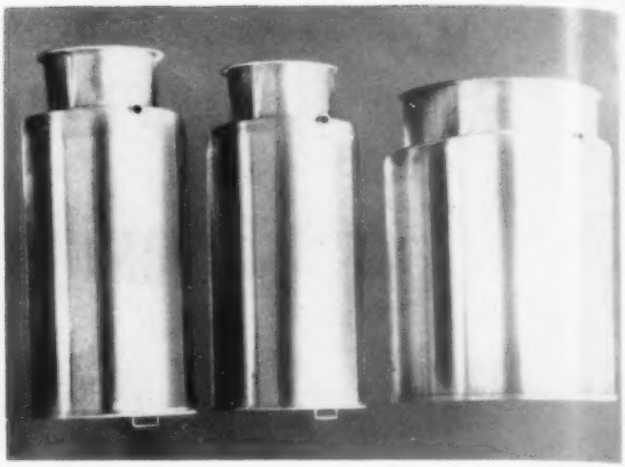
constituents of furnace and heating equipment—which frequently requires numerous engineering changes in the prototype stage in order to conform with rigid specifications of the American Gas Association. Parts of the type in question once had to be developed over a period of many months by tedious manual methods, but with flexible drophammer tooling the development interval has been reduced to a matter of days and prototype costs have been cut by a margin of at least 90 percent because:

(a) Each part is formed with comparatively great speed and precision.

(b) Small engineering changes can often be made on the dies themselves through the use of oxy-acetylene gas welding equipment.

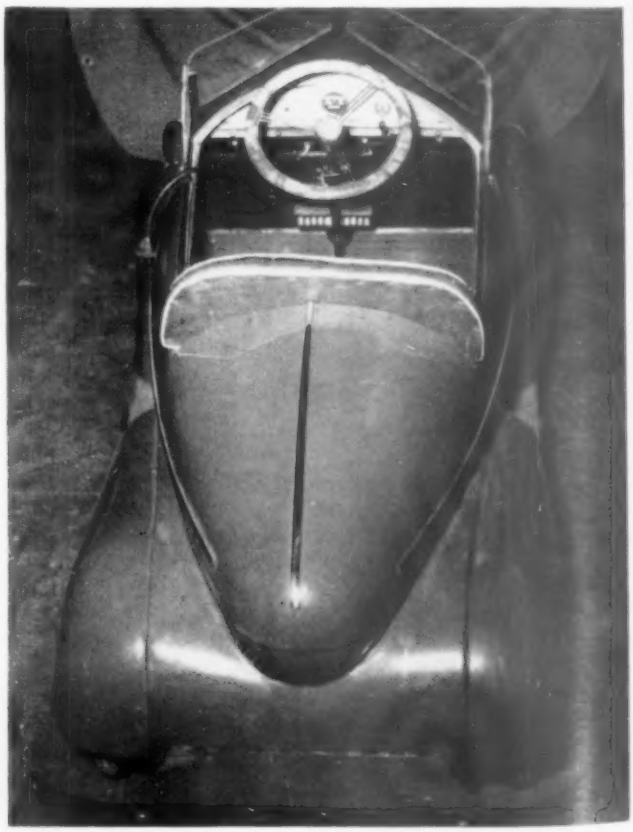
(c) Major engineering alterations can be rapidly accomplished by reworking existent plaster patterns, or by making completely new patterns, so that new casting molds can be made and new tooling casts can be produced with the remelted or reclaimed alloys in obsolete punches or dies.

Typical drophammer setup, and part being formed on hammer with low-cost dies, are shown above.



A number of steel containers are shown here by way of illustrating types of work which can be economically produced with flexible tooling.

In a number of cases, manufacturers have used flexible drophammer tooling to make "production samples" in order to sales-test new product designs before risking large investments of money in the more permanent types of production tooling. This is a desirable procedure even when the merits of a design have been proved, since many good designs fail to attain the degree of consumer acceptance that is required to maintain a profitable mass-production program; and, often as not, it has enabled manufacturers to improve acceptable products so that the latter could command a greater volume of sales.



Above is a small electric automobile being manufactured on a limited-production basis in the Los Angeles area. Its streamlined body parts can be stamped with flexible tools at an average cost of $50 per body.

Surface Grinding On Vertical Spindle Machines

By S. C. Hilliard

THE CARBORUNDUM COMPANY

THE VERTICAL SPINDLE surface grinder is usually used where there are large areas of flat work to be ground and for heavy stock removal. Many shops use the machine only for heavy stock removal and to generate reasonably flat or parallel surfaces. Close tolerance work can be done with these machines by skilled operators; it is not unusual to hold a full tableload of parts to plus or minus a half a thousandth of an inch.

On a typical job, such as a piece of 20 x 20 x 1 in. thick boiler plate, rough edges are snagged off if the plate has been flame cut so as to get one flat side to lay down on the table. If the work is warped, it is shimmed up. Then, on the Blanchard grinder, the magnet is turned on, the work is traversed under the wheel head, and grinding begins. The usual infeed for a standard general purpose wheel would be about 12 to 16 thousandths per minute. (There is a graduated dial on the machines which starts at 4 thousandths per minute and runs up in some cases to over 100 thousandths per minute).

Scale is the biggest problem we have on this type of grinding because it can not be kept out of the wheel and consequently it will load most wheels. The wheel must be dressed and touched up until the surface is fairly clean, at which time the work can be brought down to size. The 36 inch tables on these machines rotate at from 6 rpm to 33 rpm in the case of the Blanchard and 36 rpm in the case of the Hanchet. A good average table speed is about 12 to 18 rpm, and most work can be done in that range.

Assume for a moment that the wheel head is set for 12 thousandths downfeed and the table at 16 rpm. The ammeter is the principal index as to the wheel efficiency and the job the machine is doing. In the case of the 220v machine the ammeter runs to 150 amps, and in the case of the 440v it runs to 74 amps. It is the tendency in most shops to be afraid to draw a load on the ammeter. As you grind a fairly large area like 4 or 5 hundred square inches of work, the ammeter should usually pull 120 or 130 amps on 220v if there is any wheel efficiency at all.

Many operators are afraid that either the work will be loosened from the table or that the spindle will be damaged by putting on too much load. The machine was made to run at 120 to 130 amps on a good sized load of work and the wheel efficiency is not there unless the machine is operating up to that load. If the wheel is operating under that amount of power on the average work, it definitely is too soft a wheel. There will be difficulty in holding size as well as trouble in getting the stock off. There are heaters on the machine which will kick out if too much current is pulled. This will save both the spindles and the wheel because if the machine goes up to a full 150 amps on the machine and stays there 30 to 40 seconds, the heaters will kick out. Normally, the needle rides up to 120 to 130 and it stays around there. The wheel breaks out when it gets to the maximum rating and drops back again; then you know the wheel is working right. If the feed is shut off and the needle doesn't come back down in a fairly short time, the wheel is definitely glazed because it isn't breaking free, relieving the load, and letting the needle come back down. One of the tricks in this type of grinding is to get used to reading that ammeter and knowing its effect on the grinding action.

If the wheel is a little hard for this type of work, compensation can be made by increasing the infeed. The general tendency has been in this to ease off the infeed because the wheel is acting harder. It is much better to step up a notch on the infeed, break that wheel out, make it grind—make it go to work—than it is to ease it off, because you will do nothing but burnish the wheel if it is a little hard.

There are two possible problems here: either the grain type is wrong or the wheel is graded too hard. Harder grading can be overcome by a change in infeed. But you cannot usually overcome the wrong grain selection by changing infeeds. A point to remember in grinding is to grade the wheel for the area to be ground; and to select the proper grain for the metal to be ground.

Four hundred square inches of work is a medium load on vertical spindle machines. Four to five hundred square inches is about the average job. Over five hundred square inches, a drop of a grade in wheel hardness must be considered because after that the machine will not pull the load unless the metal is exceptionally soft and ductile and has no particular resistance to grinding.

From a **paper presented before the Abrasive Cutting Conference sponsored by Westinghouse Electric Corp., and presented exclusively by *The Tool Engineer*.**

The problem of variation in work is common on these machines. They are seldom set up for one single part. They will be used to grind soft material, hard material or high speed steel at 65 Rockwell "C." In order to do that there must be an adjustment of the grinding area to the wheel unless you want to change wheels. We'll take a typical grading, one that is well known as a general purpose wheel:

AA 46 - H 7 - V 22

Another would be DGA 46 - H 7 - V 10.

The grit size is the same. The grade is the same. The bond is the one that goes with each of the different grains.

Notice there are two grain types. The first wheel is for general purpose work. If there is a large amount of high speed steel or other hardened work, it would be preferable to the second wheel, which is slightly tougher and will stand more soft work. The first is the familiar white grain and the other is the blue wheel for general purposes. In the case of those two wheels, if the work has been hardened, the area would have to be cut to about 200 square inches. Assuming we were using the first type of wheel, the work should be such that it is spaced around the table, rather than one piece which covers the center. If it were hardened work, you couldn't grind with a wheel of "H" grade which covered the center of the table. We usually start off by putting a few pieces on to see what the wheel will take, then adding a few more pieces until we get the maximum effective load. The trick in making this type of grinder a general purpose machine is usually that problem of area.

There is also the problem of heat when dealing with hardened work on the vertical spindle machine. The result is checking or distortion. In this event the ammeter must be kept down, because the higher the ammeter goes, the more heat is produced. The ammeter should be up to 120 or 130 for soft work, but for hardened work, I don't like more than fifty or fifty-five amperes on 220v. That is about as much as hardened work will take.

Opinion on the question of grit size is changing in the industry. It was the custom to use 16 or 20 grit. The reason is that chip clearance is easier on the smaller grain size. Penetration is also better on harder work and the chip that is pulled out of the metal is not as large, therefore, does not offer as much resistance to the grain. The best size for general purposes is around 30 grit. The best for hardened work is around 46 grit. The wheels are more uniform in the finer grit sizes, they hold tolerances better and the operator can tell what he is doing with an automatic feed. These are some of the advantages of finer grit that are beginning to be realized.

The question of feed is different, naturally, with harder work from that encountered with the soft boilerplate type of material. An operator can feed a piece of soft metal at a fast rate and rip off the stock. Hard work cannot be fed fast because it takes time to penetrate it and cut it out. The result of overfeeding of hard work is checking of the work. There is nothing mysterious about grinding wheels. There are a few simple fundamentals in setup and technique. I think that we are using too many wheels and I believe that if you experiment with the machines under your control you will find that you can cut down the number of wheels you are using by regulating the area, infeed, and setup.

The general practice is to use slightly coarser grits on cast iron and non-ferrous metals than we use on steel. For instance, 24 grit would be about right to start with on the non-ferrous or cast iron jobs whereas we normally use 30 to start with on steel. The abrasives are separated into two basic classes, as you know, silicon carbide and aluminum oxide. Carborundum's aluminum oxide is called Aloxite, Norton's is called Alundum. Silicon carbide is called Carborundum with us, Crystalon with Norton. We use silicon carbide on cast iron where we have heavy stock removal and where we have only cast iron to grind. And we also use silicon carbide because we do not have to change wheels every time we put a piece of steel on the machine. But for general work—a mixture of cast iron and steel and other things—I prefer a grading started in the aluminum oxide grains. The white grains, which are a more friable refined grain may be satisfactory, or if there is not too much iron to grind, standard general purpose blue wheel may suffice. That is especially true when you are grinding edges or bosses, housings, castings, or if you are just grinding gasket seats or something of that sort. These can be easily ground with aluminum oxide. If there is a big flat plate covering the center of the table, there should be no difficulty regardless of the grade used, and the recommendation is silicon carbide. It is a more free-cutting wheel on iron. The same is true of any of the non-ferrous metals. If there is not too much to grind, I would suggest aluminum oxide. If it is a straight production job, I would advise experimenting with the silicon carbide until you get the grading you want.

Summarizing, we find that the vertical spindle surface grinding machine can be used for fast stock removal on broad areas of flat work and on a broad classification of work where there are flat sides and edges to grind. Fairly close tolerances can be held and good finishes can be obtained. You will probably have to experiment with your coolant a little. But, you can get good finishes on these machines if it is necessary. The machines are especially adjustable to accommodate a wide variety of sizes and metals. By increasing or decreasing the area of work to be ground, these machines will efficiently grind the soft metals or hard metals. It is also apparent that the area of the work placed on the table is one of the principle factors governing the performance of either the wheel or the machine. The second factor is the infeed. I do not think that table speed makes anywhere near as much difference as the infeed and area. For general purpose work where there is not much hardened material, a thirty-grit wheel such as DGA 30 - H 7 - V 10 would be applicable to most work. If the majority of the work is to be hardened or high speed steel it is better to use a finer grit wheel, such as AA 46 - H 7 or AA 46 F7 - V 22. You have seen that if the areas to be ground are more widely spaced on the table, a harder grade wheel can be used with greater efficiency. The further away from that center you can stay, the harder wheel you can use and the greater will be the wheel efficiency.

As shown above work on the vertical spindle grinder should be evenly distributed about the table.

Design of Fixture Elements

By Hans W. Smith

GAGES SERVE AN IMPORTANT function in manufacturing; upon them rests to a large extent the responsibility for control of quality. From continued usage, gages themselves suffer from wear and must be continually checked with a master gage. A number of gage designs are shown here for applications which vary according to the nature of the work.

Fig. 1. To check a shaft, a ring gage is employed. The go-gage is made to the high limit. The no-go-gage is made to the low limit. The latter, aside from being marked, is made recognizable by a circular groove cut into it. Both gages are knurled. Bore is straight, no chamfer, outside edges are rounded.

Fig. 2. A plug gage is used to inspect bores. Go and no-go plugs may be on the same handle. The go side is made to the low limit; the no-go side to the high limit. The handle has a milled flat for markings. Centers for grinding are provided on the plugs. Both plugs are ground straight, with no bevels.

Fig. 3. For large bores, a plug gage is too heavy to handle. A flat gage as shown with an elongated hole for handling is used for such work. Go and no-go sizes are ground on opposite sides of the gage, or they can be ground on one side. The latter type eliminates turning the gage over for checking with the no go end, but is not practical for very close limits.

Fig. 4. This shows a flat gage with the ground hardened surface separate and screwed on for convenient replacement.

Fig. 5. Tolerance gage block as used on checking fixtures, are ground pieces with a step giving the tolerance permitted on the work. The work must line up within the two faces. A similar gageblock is used on a welding fixture for setting the part to be welded in order that a lever touching the work lines up within the tolerance stop of the gage block.

For shafts, where the diameter is ground near a shoulder, a relief should be shown on the drawing which leaves clearance in the corner. A radius clearance is best, because it leaves a round corner which avoids cracks in hardening or those due of fatigue stresses. It is also simple to dimension by calling for the relief radius only.

Fig. 6. A shaft that must be ground should show grinding centers on the drawing, and this center should be further relieved as shown, to insure true running while grinding.

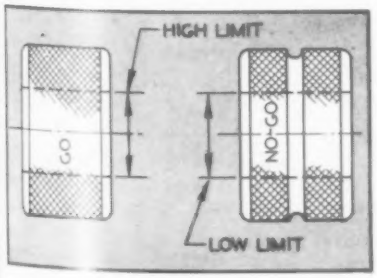


FIG. 1

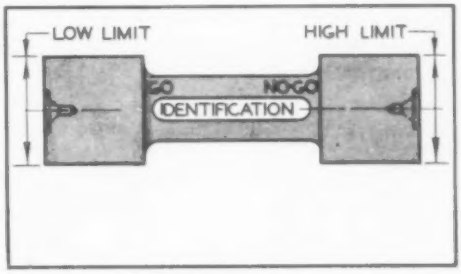


FIG. 2

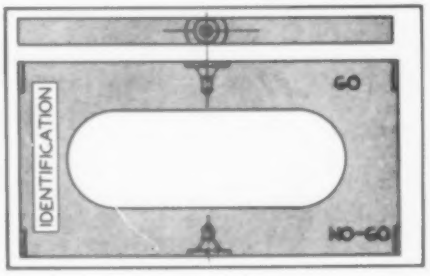
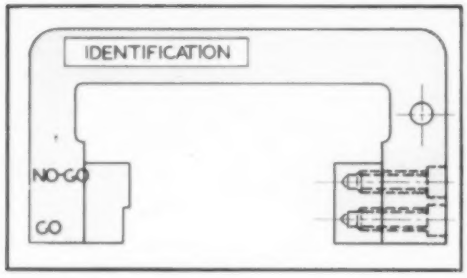


FIG. 3



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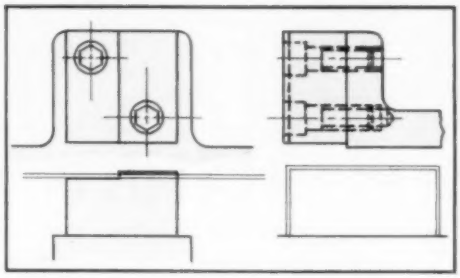


FIG. 5

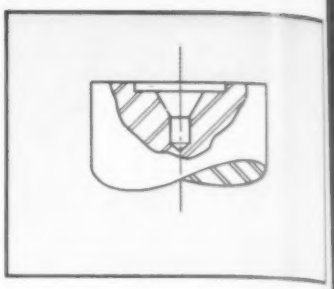


FIG. 6

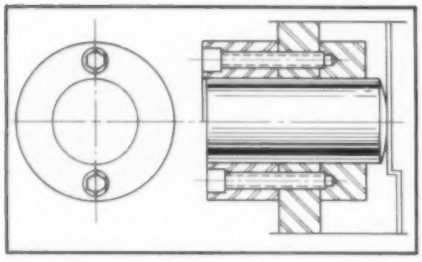


FIG. 7

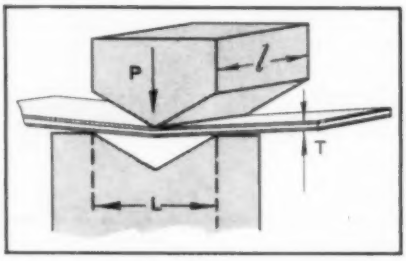


FIG. 8

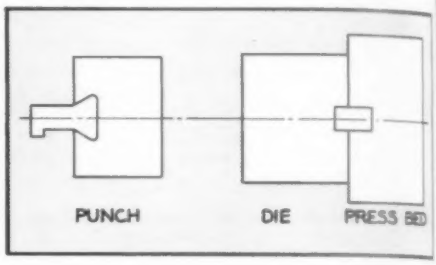
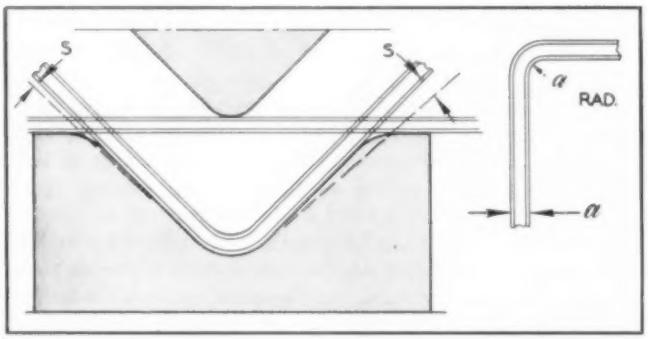
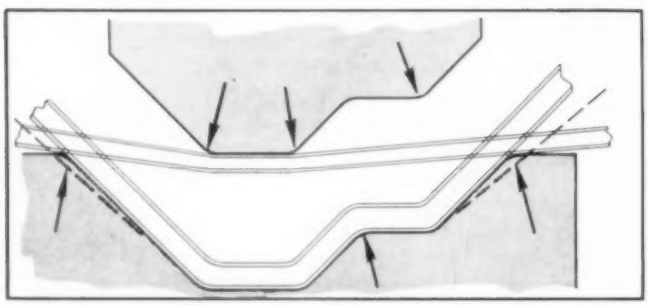


FIG. 9

Below: Fig. 10 (Top); Fig. 11 (Middle); Fig. 12 (Bottom)





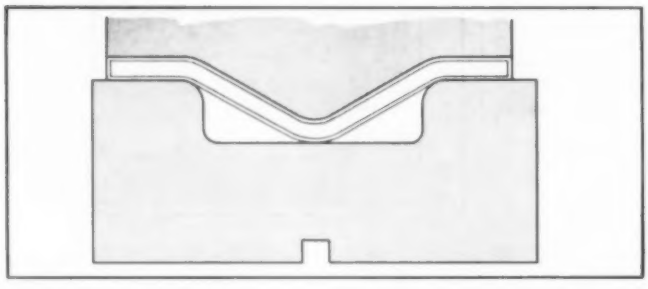


Fig. 7. On a checking fixture the height of a machined face may be checked by setting the work on rests and sliding a scale across a gageblock as described in Fig. 5. As an alternative, a flushpin may be dropped through a bushing onto the spot to be measured. The pin is so dimensioned that its height is flush with the top of the bushing when the work has the required nominal dimension. The bushing can be machined off with a step giving tolerance for the required heights of the pin above the work.

FORMING

Forming and bending as done under brake presses and bulldozers may be done hot or cold. The following illustrations apply to cold work unless specifically stated. Forming consists of pressing the work between a lower form, the die, and the upper form, the punch. Most brake presses are built so that the punch descends to its lowest position and ascends and stops. It can be lowered and stopped at any intermediate point for setting up. The space between the bottom of the ram in its lowest position and the top of the bed is called the shut height. The heights of the die must equal the shut height. The shut height of a press is always given with stroke down, adjustment up.

Fig. 8. The force required for cold forming can be calculated from the empirical formula:

$$P = \frac{CS\ell T^2}{L}$$

P = Pressure in lb
S = Tensile strength of stock in psi
ℓ = Length of bend in in.
T = Thickness of stock in in.
L = Width of die opening in in.

C	L	
1.33	8.T	Square sharp bends
1.24	12.T	
1.2	16.T	Round bends

Fig. 9. To hold the punch to the ram and align it with the ram, the punch has a tongue projection as shown. This tongue can be milled on the punch, forming an integral

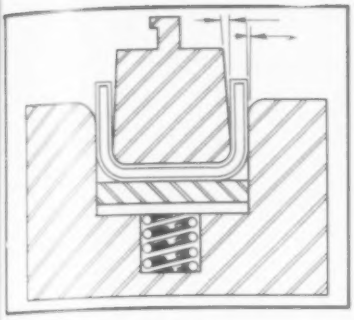


FIG. 13

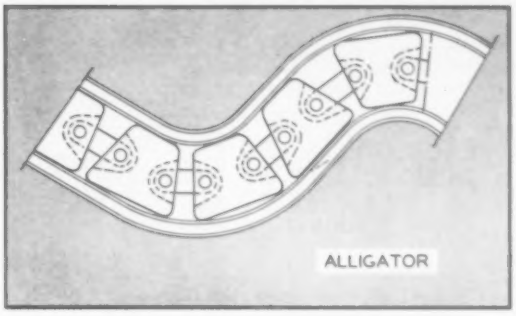


FIG. 14

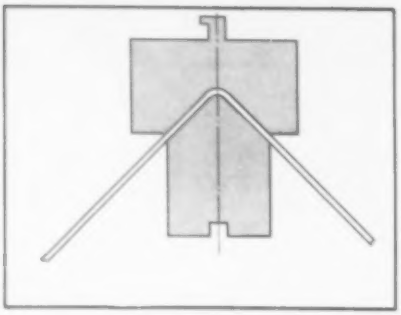


FIG. 15

part of it. It can also be made as a separate piece as shown in the illustration. This design has the advantage of more economical production of the tongue. Tongue can be hard, and the punch can be quickly changed to opposite hand by turning the tongue around.

The die is lined up with the press bed by a key, which can be milled on directly or the die can have a keyway and separate key. This design is better for storing dies, since the milled-on key is easily nicked and is in the way for setting the die on the flat.

When a part is formed which by its shape tends to stick in the die and in part clings to the punch, the ascending punch exerts a stripping pressure and the die must be fastened to the press. Other jobs also may require the die to be held down to the press. A flange machined on the die will permit this, using the T slot in the center of the machine bed. To handle the die with crane it should have tapped holes in the ends for eyebolts.

Fig. 10. The smallest inner radius for a cold bend equals the metal thickness. The angle to which a sheet is bent is slightly larger than the angle on the die due to the elasticity of the metal, which causes the sides to spring back somewhat after the punch ascends. Thus the die and punch are made to a sharper angle than the finished work. The amount of springback S is small for thin stock (under ¼ in.) and for soft stock, from ½ to 2 deg. For parts that cannot be adequately covered by the die, springback is more, up to 6 deg.

Fig. 11. The wear occurring on a die or punch depends on the relative motion between die and work, and the work pressure at this point. To study this it is useful to picture the work while it is still in the flat condition with the punch beginning to descend, and also in the finished position as shown in the illustration. It is apparent that the points shown by arrows are points of wear, and in this case punch and die should be hard.

To have minimum springback, the die and punch should cover the work for a reasonable length. Where such coverage is scanty, the springback will be greater. Thus in the illustration the right leg of the bend will show more springback than the left leg.

Fig. 12. In the case shown by the illustration, the metal is shaped by the punch and the die need not be machined to the contour of the work but must be only relieved to permit forming. In similar cases it is often possible to save on the cost of the die by simplifying the machining.

Fig. 13. When forming a channel, a follower plate backed up by springs is used to hold the plate up to the punch, producing a flat web as shown. Without this the web would first form hollow and some of this would still appear in the finished shape. The sides of the die should be cut under a slight angle, about one deg, to permit the springs to push the work out of the die. The sides of the punch should be undercut, also about one deg on a side to prevent sticking of the work to the punch.

Fig. 14. When box shapes or channels are formed hot or when the wall thickness makes collapsing of the wall under the forming pressure likely, a chain of form pieces is used called an alligator, which supports the walls during bending, yet permits pulling out after forming.

Fig. 15. Most bends on a brake press are formed up because the flat plate rests better on the V-die. But long thin sheets are sometimes formed down by mounting the punch to the bed and the die to the ram. The plate must be held, especially in the flat condition, but lies better without being kinked or bent after forming.

ASTE-Sponsored Book on Manufacturing Analysis Is Released

MANUFACTURING ANALYSIS, by Richard F. Kipers of Rochester Institute of Technology, is a 450 page book primarily designed as an aid in the training of tool engineers. The material is logically presented so that students may advance through the course in progressive steps, first learning about manufacturing processes and equipment and then applying the principles involved to planning and analysis of operations as well as selection and use of machines and accessory tools.

As the title implies, the work is essentially an analysis of manufacturing and embraces methods of manufacture, the tools used and tool and production costs. Of the 22 chapters, of which the first is an introduction by President Mark Ellingson of the Institute, fourteen are devoted to actual manufacturing processes and embrace practically every commonly employed method of machining. The balance is devoted to inspection, materials handling, assembly, tooling costs, analysis of operations and tolerance balancing.

While the full responsibility for accuracy of material and its preparation rests upon the author, the work as a whole is sponsored by the American Society of Tool Engineers which, through its National Educational Committee, made a financial grant to Rochester Institute of Technology. Members of Rochester Chapter, ASTE, have further cooperated toward review and professional endorsement of text material. All this, together with collaboration of leading industralists and tool engineers, tends to make this work a highly authoritative book. Published by McGraw-Hill Publishing Company.

designing for efficiency

Multiple Redraws with Triple-Action Die

By James Walker

A TRIPLE-ACTION DIE with possibilities of significant savings is so designed that shells or cups which are ordinarily produced in two redraws, entailing as many dies, can be drawn through both stages with the one die and with one stroke of the press ram.

The die can draw parts of various shapes—round, square, oval or necked—and parts of various depths simultaneously through double or multiple draws. Since the metal is heated as it passes through the first redraw, and enters the second redraw before heat is dissipated, at least one press, one operation and one handling are eliminated. Between-draw annealing is not required; thus eliminating the incidental pickling and washing.

The die shown in Fig. 1 was designed to draw the cup shown at *C*, Fig. 2, which denotes the final redraw—that is, the finished part just prior to trimming. At *A*, Fig. 2, is shown the pre-drawn cup, while cup *B* denotes the first redraw. The die was designed for use in a Waterbury Farrel double-action, cam-operated press.

As designed for a comparatively simple shape, the die can be constructed at a reasonable cost—in fact, the die shown was a lathe job almost in its entirety, the parts being ground in a cylindrical grinder after hardening.

However, the principle of triple-action could well be applied to the mechanism of the press rather than to the die itself. That is to say, make available a fourth action operating from the crank or an eccentric, or, hydraulically to produce a second draw simultaneously in addition to the usual undermotion or knockout. It is essentially a production tool for long runs and not recommended for short-run jobs which may be more economically handled with simpler dies.

As set up in the press, operation of the die would be as follows: The pre-drawn cup is placed in the guide nest. The spring-loaded blankholder *A*, Fig. 1, descends along with the cam-operated blankholder *B* and supports the blank while the blankholder proper completes the first redraw. The plunger or inner slide then descends and completes the second redraw, when the cup is stripped from the punch by the spring-actuated ejecting ring. Blankholder *B* is also the first redraw punch and is actuated by the blankholder action of the press.

The component parts of the die are photographically shown in Fig. 4. The punch assembly is designated by *A*, the die ring—which, in turn, nests in the die shoe—by letter *B*, while *C*, *D*, *E* and *F* designate the guide nest, the first redraw die, second redraw die, and the spring-loaded ejector ring or stripper. Parts *B*, *C*, *D* and *E* are all enclosed in the die ring *A*. All components are in absolute alignment, and the construction permits easy dismantling with quick replacement of parts. Construction features are similar for the punch as assembly which, with the exception of the final redraw punch—and that aligning with the punch-blankholders—is a self-contained unit.

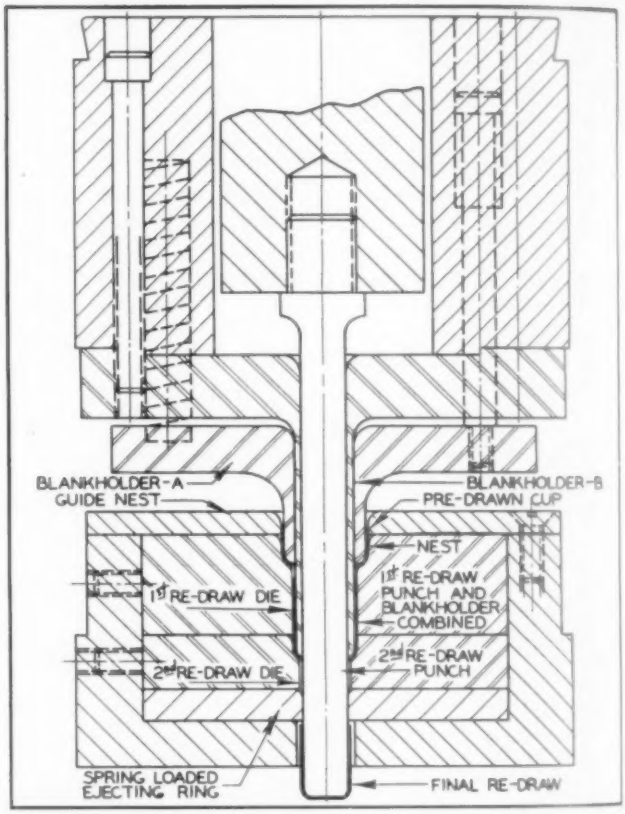


Fig. 1. The triple-action die as designed for use with a double-action cam-operated press. The predrawn cup is placed in the guide nest and, as the press ram descends, the cup is progressively redrawn through the 1st and 2nd redraw dies and stripped from the 2nd redraw punch by the spring-loaded ejector ring. The heat generated by the first redraw obviates the need for annealing between draws. The component parts of the die are further shown in Fig. 4.

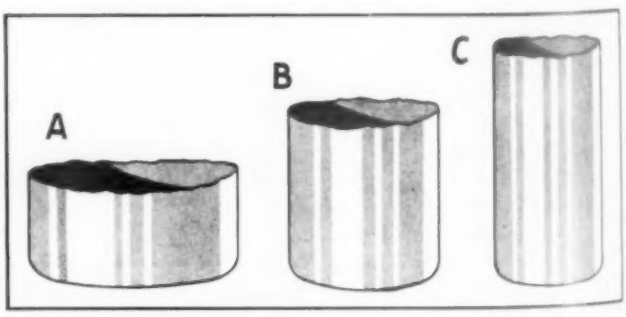


Fig. 2. At A and B—the predrawn cup and the cup after the 1st redraw. C shows the cup after final redraw. Both redraws are performed with one stroke of the press ram. The shell shown is drawn from 0.015 stainless steel.

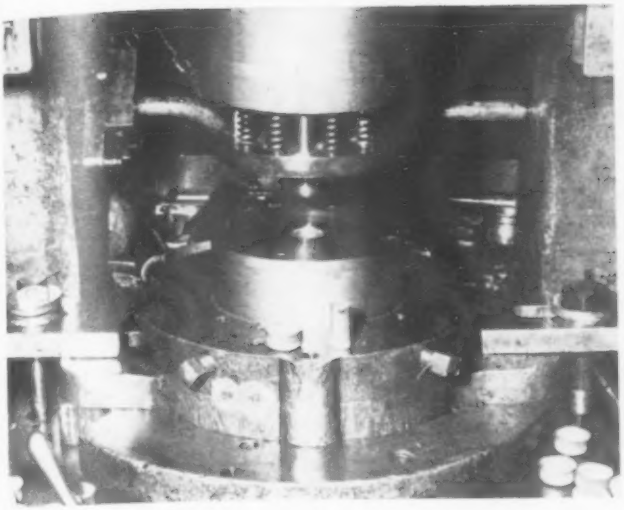


Fig. 3. The triple-action die as set up in the press. A predrawn cup, and the shell after final redraw, are shown on the die shoe.

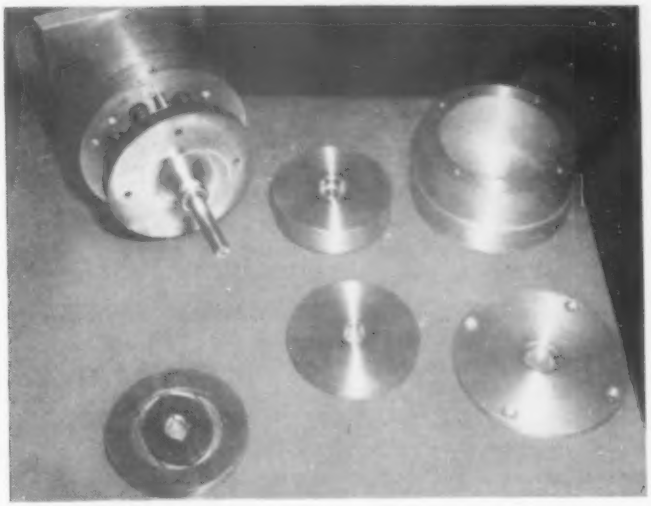


Fig. 4. The component parts of the triple-action die. A shows the punch assembly, B the die ring, C the guide nest, D the combined nest and 1st redraw die, E the 2nd redraw die and F the spring-loaded ejector ring. Refer to Fig. 1 for relative location of parts.

DRILLING UNITS INCREASE PISTON OUTPUT

By M. D. MacNaughton

CHIEF ENGINEER, KELLER TOOL COMPANY

DRILLING OF SMOKE holes in cast-iron pistons, formerly done on conventional drill presses at the DeLuxe Products Company, LaPorte, Indiana, is now done automatically with two standard drilling units, using solenoid valves for controlling the drills and indexing mechanisms. Smoke holes 5/32 in. in diameter are drilled under the oil ring groove through ⅛ in. wall thickness and through the 30 deg bevel below the oil ring groove through ¼ in. wall thickness.

The setup, as illustrated, is arranged for drilling the 30 deg angle holes. The angle blocks supporting the drilling units are removed when drilling the right-angle holes under the oil ring groove. All pistons are first drilled with 30 deg holes and then the setup changed to drill the right-angle holes.

The cam-action holding fixture accommodates pistons of various diameters and heights within normal limits. The fixture is indexed by an 8-volt solenoid-operated master control valve. Drilling units may be moved in or out for different sizes of pistons by loosening two clamping knobs.

The drilling units are self-contained air-powered units with hydraulic dashpot for controlling the feed rate. Length of drilling stroke is adjustable and rate of feed may be varied to suit drilling conditions. Automatic control of starting, feeding, and retracting the drills is achieved by micro-switches mounted on the drilling unit at right in the illustration. Since the drilling cycle for both tools is identical, only one set of controls is required.

Production with the setup is 55 holes per minute or one complete piston with ten drilled holes in eleven seconds. The entire time of the operator is used for loading and unloading the fixture.

Above is the inexpensive cam-action fixture for automatic drilling on cast-iron pistons.

Barrel Tumbling of Parts Prior to Finishing

By Edward Engel
Consulting Engineer, Colonial Alloys Company

BARREL TUMBLING, using abrasives and lubricants, (usually water with or without soap) acts to scrape or wear off high spots which are found on the part as a result of manufacture. The actions are impingement and abrasion, that is, impact and collision. Such actions are produced by pressures of intermittent duration.

Effective pressure of the abrasives on the work is obtained as follows:

(1) The abrasives should have a greater specific gravity than the work.
(2) A much heavier load of abrasives is required as compared to work load. The usual ratios of abrasive to work are 2 : 1 or 3 : 1, depending on the type of operation.
(3) A barrel diameter large enough to permit a heavy load of abrasive. The diameter of the barrel is not necessarily contingent on the quantity of the work, for one piece of work calls for about as much pressure as a hundred or more pieces.

Barrel tumbling, regardless of the specific aim, removes more or less scale or burrs and creates a degree of lustre. An attempt, however, to obtain the correct amount of each action in one barrel operation is difficult, if not impossible. Therefore, roughing and deburring operations are usually conducted in separate barrels.

Whether roughening, deburring, descaling or burnishing in tumbling barrels the general considerations are as follows:

(1) Diameter, length and shape of barrel.
(2) Type of barrel lining.
(3) Rpm of rotation.
(4) Ratios of work to abrasives.
(5) Height of load in barrel.
(6) Means of rinsing, straining, loading and unloading work.
(7) Timing for various sequences.
(8) Nature of metal, as to its surface condition and hardness.
(9) Surface finish required.
(10) Types of abrasives as to grain size, specific gravity and shape.
(11) Nature of lubricant: water and abrasives versus oil and abrasives or even versus dry operations.
(12) Purity and hardness of the water.

Tumbling Operations Detailed

Barrel operations may be separated into four main types as follows: (1) Tumbling (roughing), (2) deburring, (3) burnishing, (4) rolling. Tables I and II detail the factors in barrel operations.

Tumbling (roughing) involves the use of soft metal slugs or shapes with water, and with or without sand, pumice or slag chips. It is a non-selective cutting-down operation equivalent to wheel grinding and snagging on castings or forgings.

Deburring operations use granite or equivalent abrasive, water and soap or proprietary compounds. It is a selective cutting-down operation equivalent to selective wheel grinding or filing. The dimensional changes are less than in the tumbling or roughing cycle.

Burnishing is a precision method for the removal of unwanted surface metal. The controlled accuracy of the operation is indicated by its use, almost to the exclusion of other means, in the finishing of ball bearings. The balls are barrel finished and held to an accuracy or 0.0001 to 0.00005 in., with a sphericity of one forty-thousands of the diameter.

Barrel burnishing, it is true, does not provide the brilliant lustre of buffing wheel operations. On some work, however, burnishing followed by color-buffing produces a better finish and at less cost than by the buffing and color-buffing sequence. The latter method also causes greater metal loss. Some shapes such as rods and tubing may lend themselves to self burnishing—no abrasives are required.

Tool marks on flat surfaces are not removed as effectively in barrel burnishing operations as those which occur on convex surfaces. The cost is apt to be equal to wheel buffing, with greatly inferior results.

Sandblasting produces heat, and the impingement of the sand renders the work unsuitable for plating. No heat is developed in barrel operations nor is there any degree of abrasive impingement. At high speed, a barrel operation can simulate the appearance of sandblasted work. However, high speed operations are impractical as the work is likely to be nicked. Therefore, barrel operations are performed at relatively low speeds. Barrel burnishing peens and cold works the metal. Wheel buffing bends and abrades the metal peaks.

Rolling is a term used for a barrel operation which in results ranks between deburring and burnishing.

Applications of the Various Processes

Cutting-down and deburring operations on aluminum and brass are performed in unlined steel barrels. The abrasive may be sand. The time of the operation is 10 to 15 hours. The work is then washed and drained on screen-trays and loaded into an octagonal wood-lined steel barrel for the burnishing sequence.

The burnishing barrel is rotated at about 36 rpm. The abrasive may be sand, rotten stone or fine tripoli. Water is used as the lubricant. Or, as an alternate to the above operations on aluminum and brass the following sequences may be used.

Aluminum and brass: (1) In the cutting-down and deburring operations the abrasive load may consist of 5/32 in. diam steel or steel shapes with a small amount of fine sand, 2 ounces of soda ash and water. The ratio of the above material to work is 2 : 1. The barrel load is two-thirds full in a 32 in. diam by 45 in. length octagon-shaped barrel. After 10 to 40 hours operation, the work may be bright-dipped to remove dark films.

Following the above operation, the work is transferred to a wood-lined barrel. The barrel load is a 3 : 1 ratio of

TABLE I—BARREL DEBURRING—POLISHING—BURNISHING

FACTORS	TUMBLING	DEBURRING	ROLLING	BURNISHING
Operation	Cutting-down	Selective cutting-down	Polishing and light cutting-down	Buffing
Equivalent wheel or manual operation	Grinding and snagging	Grinding and filing	Polishing	Buffing
Work	Castings and forgings	Castings and forgings and machine-screw products	Castings, forgings, stampings, and screw-machine products	
Size limitation	Longest dimensions NOT over 6 in., with exception of rods			
Shape limitation	Work with sharp edges or thin cross-sections or interlocking parts, and hollow and drilled sections present difficulties			
Dimensional changes	Considerable	Less than in tumbling	Some cutting-down, but to a controllable degree	Not appreciable
Surface appearance	Even	Even	Smooth	Lustrous
Effect on metal	Tends to neutralize strains	None	None	None
Other effects on surface	Removes skin, scale, burrs, fins, corners	Removes burrs	Removes flash, wire, edges, pits, rough spots, rust and light burrs, and round corners	Closes pores
Medium	Annealed metal slugs, stars, jacks, punchings	None	Metal tacks, slugs, steel balls, steel wool. Softer working medium used than in burnishing	*Self burnishing or hardened steel balls or odd shapes ratio balls to work—1:2
Abrasive	With or without pumice, slag, chips, sand	Granite or other equivalents	Cinders, slugs, sand alundum, emery, carborundum, pumice. For brass and aluminum—Crocus lime, chalk, meal, pumice, felt, maple, lignum vitae	None
Dry operation	Seldom	No	Screw-machine products in dry, fine sawdust for brightening	No
Wet operation	Seldom	No	Content of water regulates extent of cutting-down action	Carefully selected lubricant or soap
Chemicals	Oxalic acid or cyanides aid the removal of scale	Proprietary compounds	Sulphuric or hydrochloric acid for removal of scale. To improve the color of steel use tartaric acid or a cyanide; sodium silicate may be added for soft metal	No, though with brass a cyanide solution may be added
Operation on light metals		Low rpm	Fine, soft abrasives with plenty of water. Low rpm. Fine, dry polish for soft metals 6 in. vegetable ivory	Small balls, low rpm. 30 to 40 average rpm.
Operation on heavy metals		Higher rpm	Coarser and harder abrasives and with less water and greater rpm than with light metals	Coarser balls and higher rpm 40 to 60 rpm.
Type of barrel	Horizontal	Horizontal	Open-end tilting for small parts; horizontal may be used	Horizontal (small)
Time of operation	1 to 10 hr.	2 to 24 hr.	Aluminum, 1 to 20 hr; brass and bronze, 1 to 15 hr; malleable castings, 30 to 40 hr; grey iron, 70 to 80 hr; hot-rolled steel, 50 hr. stamps, 10 to 100 hr.	20 min. to 10 hr. (silver 20 min.)

*Burnishing balls are force-dried and treated with a rust preventive to inhibit rust formation when not in operation.

One difficulty in barrel operations is in keeping the abrasive materials in working suspension. Greater efficiency and shorter cycles may be obtained when a proprietary material is used to aid in the suspension of the abrasives. Abrasives which remain at the periphery of the barrel do little work and are shortlived. This material also prevents the metal media from rusting between operations.

Overloading of the barrel is one of the major sins in barrel operations, even worse than excessively high speed.

Barrel polishing or burnishing in high and narrow barrels closes the pores of the plated metal and helps eliminate spotting-out to even a greater extent than alternate hot and cold-water dips do, following certain plating solutions.

TABLE II—CAPACITIES OF ROTO-FINISHING OCTAGONAL BARRELS

No. of Compartments	Size of Compartments (in.)	Chip Mass	Work Load in Pounds	
			Steel-Brass	Aluminum
2	27 x 32	13½	150	90
3	15½ x 32	7½	80	50
4	10½ x 32	5	60	35
2	19½ x 32	9½	100	60
1	19½ x 32	9½	100	60
1	23 x 21	3¾	25	15
2	8 x 12	½	5	3

3 hp. required for 32 in. barrels at 20 rpm.

abrasive to work. The abrasive may consist of limestone chips, with a little Sturgis No. 100 or equal rough grinding composition and a few inches of water. About 9 to 10 hours operation is required.

Stainless steel cutting-down operations are conducted in a cast iron or steel unlined barrel. The barrel may be 27 x 11 in., or 33 x 19 in. Speed or rotation is about 15 rpm. Hardened steel balcones may be used. The loads are 700 lb and 300 lb respectively. The time is 8 to 9 hours.

Following the above operation, the work is transferred to a maple-wood-lined barrel for burnishing. The burnishing abrasive may consist of 10 lb of Matchless powder, 16 lb of caustic soda and water (8 gallons); or 10 lb of emery flour and 6 lb of Aloxite and 8 gallons of water. A 30 x 16 in. barrel has a 600 lb capacity. The barrel preferably is of the high and narrow type. A ratio of 3 : 1 abrasives to work is required, and operation time is 9 to 12 hours.

About 0.0003 in. of metal is removed from stainless steel in the cutting-down operation and 0.0001 to 0.00015 in. in burnishing. Stainless steel is not nearly as responsive to barrel operations as ordinary carbon steels. Therefore, the high-narrow barrel is necessary to provide the required pressure on the work. A fine-grained, stainless steel should be specified in order to save cutting-down time, however, bright finishes do not result in barrel burnishing of stainless.

Steel: Viena lime may be used in burnishing regular carbon steel; a 12-15 hour operation is necessary. About 0.00075 in. of metal is removed. For deburring steel the work should be annealed so the balls or shapes can bite out the soft material and clear it away.

Zinc die castings may be burnished in a 30 in. diameter wood lined barrel at a speed of 13 rpm. About 100 lb of ⅛ in. diameter balls and 50 lb of work comprise the load.

Barrels, balls: In general, an oblique barrel is preferred for scale removal. All the following barrel shapes have particular merits: Long and narrow, high and narrow as well as the oblique tilting barrel. Lateral ridges in barrels carry the loads too high and cause the work to become nicked.

No round ball can burnish into an angle or groove smaller than its diameter. Therefore, most operations require odd shapes: Pebs, Balcones, finbals, diagonals and diamonstels. The steel balls or shapes must be kept clean and free of rust. Insoluble lime soaps and rust may be removed with nitric acid. Small chips for deburring fine surfaces cut slower but mar the work less. Large and small chips may be a combination which increases the speed without marring the work.

Starting with a 60-40 microinch finish, granite chips can produce 30-25 microinch surface, limestone chips can result in a 10-5 microinch finish.

The Roto process of the Sturgis Company as well as other manufacturers offer a variety of compounds for deburring, burnishing and honing the different metals and alloys. The Roto process for barrel finishing is illustrated as follows: (see Table II)

(1) Deburring: granite chips or grinding chips and Sturgis compounds.
(2) Burnishing: limestone or light honing chips and Sturgis compound.
(3) Honing after No. 2 sequences and Sturgis honing compound.
(4) Wet Coloring: steel balls or Sturgis coloring medium.

Horizontal octagonal barrels of 32 in. ID at 20 rpm require 3 hp. The barrel burnishing operations on the various metals and shapes require varying times, dependent on initial surface conditions and final requirements, for examples:

Aluminum and die castings: 1/6—8 hr
Brass castings: ¼—8 hr
Sand castings: 3—24 hr
Steel (stampings): ¼—12 hr
Steel (machined parts): ¼—12 hr
Steel and iron castings and forgings: 5—24 hr

Fixed burnishing is said to be more effective and produces finer finishes as it gives many times the pressure as compared to free-burnishing. The work is held in position in the barrel by means of suitable jigs and clamps. It is necessary to load the barrel three-quarters full; otherwise, ball-patterns appear on the work. Smaller balls and less pressures are used for soft work. Work with holes and ears may require a combination of large and small balls or shapes.

Chemical additions: Alkaline solutions are used except for aluminum. In the latter case, Orrus or Nacconal wetting agents and oxalic acid may be used at a pH of 7. After the work is burnished it should be dried in hot sawdust in a steam-jacketed oblique tilting drum, or in a centrifugal drier. Corn cobs or begasse may be used in place of sawdust. It requires about 20 minutes of drying.

Organic matter in water used in barrel cutting-down operations tends to pit the work. Hard water also causes pitting. The hardness constituents may be eliminated by the addition of 1 to 3 percent by weight of tetra-sodium pyrophosphate, or sodium tetra-phosphate and colonial type A sequestrant. No phosphate type of sequestrant should be used with aluminum.

Loading of a tumbling barrel should be accomplished at about 45 deg angle. Work and burnishing material should be alternately loaded. These precautions will prevent denting or nicking of the work.

North East West South IN INDUSTRY

The chemicals division of **The Glenn L. Martin Co.** has been purchased by the **United States Rubber Co.** All assets of the division, including the Marvinol vinyl resin plant at Painesville, Ohio, the laboratory equipment in Baltimore, patents and trade name Marvinol were part of the transaction, and will become part of the Naugatuck Chemical division of the rubber company.

Scully-Jones and Co. has announced a change in distribution policy for its style B tap chucks and drill drivers. Unlike other Scully-Jones products, these particular tools now are available to jobbers, mill supply houses and other resale outlets directly.

Harold Duncan, former district engineer in Texas, has been promoted to assistant regional manager, **Eutectic Welding Alloys Corp.**, in charge of district engineers servicing Southwestern users of that company's products.

Ford Motor Co. is sponsoring a national industrial arts award program for junior and senior high school students as a continuation of the Industrial Arts Awards originated by Scholastic Magazine three years ago. Cash awards for workmanship and design will be made by divisions including wood work, metal work, mechanical drawing, machine shop and other fields, from entries made in school shops as regular class projects.

Scholastic Magazine relinquished its sponsorship to Ford when interest proved the program to have outgrown the magazine's facilities to handle entries.

The Roto-Finish Co. has transferred operations from Sturgis, Mich., to a new factory at Kalamazoo.

Election of **Alvin J. Herzig** to the presidency of **Climax Molybdenum of Michigan**, research subsidiary of Climax Molybdenum Co., has been announced. Mr. Herzig has been associated with the research laboratory since it was opened in 1931.

Adolph D. **Mandl** has been appointed manager of the **Die-Mold Corporation's** plant, Milwaukee. Mr. Mandl formerly was associated with Allied Chemical & Dye Corp.

J. C. **Kemp**, former general sales engineer for **Ampco Metal, Inc.**, has been named district manager of the company's Chicago office. **R. J. Eckl**, assistant general sales engineer, will assume the position vacated by Mr. Kemp.

Harry E. Lewis has been named assistant comptroller of **Worthington Pump and Machinery Corp.**, Harrison, N. J. He succeeds Joseph A. Schallenberg who died recently.

Recent appointment has made **Robert A. Anderson** vice-president and works manager of the Kalamazoo, Mich., plant of **Ingersoll Steel Division**, Borg-Warner Corp.

In its recent election **Jerome A. Raterman**, president of **The Monarch Machine Tool Co.**, was named director and treasurer of the National Machine Tool Builders' Association.

John McVeigh recently joined **Kennametal, Inc.**, Latrobe, Pa., as special development engineer with the technical research staff engaged in extending the application of the company's recently developed heat-resistant material, Kentanium. Prior to his present connection, Mr. McVeigh was employed by Continental Motors Corp.

Sperry Products, Inc., Danbury, Conn., now offer a commercial ultrasonic testing service for locating defects in steel, iron and various nonferrous metals by reflectoscope and cathode-ray oscilloscope. Service centers are located in many industrial localities for the convenience of metals-producing, -processing and -fabricating plants.

Miss M. A. Caffrey, secretary of **E. Horton & Son Co.**, is celebrating her 25th year with the company and her 17th year as one of its officers.

Recent appointment was made of **K. W. Horsman** as works manager of **Worthington Pump and Machinery's** Dunellen New Jersey works. Mr. Horsman, who has been with the corporation since 1929, succeeds **B. R. McBath** who resigned.

Frank H. Bishop has been named assistant to the president, **Allied Products Corp.**, Detroit. Prior to his appointment, Mr. Bishop was associated for 22 years with General Electric Co.

J. A. Schallenberg, assistant comptroller of **Worthington Pump and Machinery Corp.**, died recently after a long illness. Mr. Schallenberg, who joined the corporation in 1918, was made assistant comptroller in 1937.

Pivot Punch and Die Corporation has announced the licensing of **Slater and Crabtree, Ltd.**, Wakefield, England, for the manufacture, under patent rights, of the company's pivot punches.

According to participating parties, the arrangement was instigated after Councilor Edward Slater, of the English concern, saw the punches in action at the **American Society of Tool Engineers Show in Cleveland in 1948.**

R. S. Reynolds, Jr., Reynolds Metals Company, was elected president of the Aluminum Association at its annual meeting, held in New York in January.

Other officers named included **E. G. Grundstrom, Advance Aluminum Castings Corp., M. E. Rosenthal, United Smelting and Aluminum Co., Inc.**, and **George N. Wright, The John Harsh Bronze and Foundry Co.**, all vice-presidents; **A. V. Davis, Aluminum Company of America**, re-elected chairman of the board; and **Donald M. White**, reappointed secretary and treasurer.

Waldemar Naujoks, authority on drop forging techniques and author of the "Forging Handbook", recently joined **Ladish Co.**, Cudahy, Wis., as a special products engineer, specifically concerned with ferrous and non-ferrous alloy forgings.

Waldemar Naujoks

Leo S. Ohman

Leo S. Ohman has been elected to the newly created position of vice-president in charge of manufacturing for **Hannifin Corp., Chicago.** Mr. Ohman formerly was factory manager with the company.

Coming Meetings

Mar. 28-31, National Plastics Exposition. Navy Pier, Chicago.

Apr. 4-8, National Production Exposition, sponsored by **Chicago Technical Societies Council.** Stevens Hotel, Chicago.

Apr. 10-14, Tool Engineer's Industrial Exposition, sponsored by the **American Society of Tool Engineers.** Convention Hall and Commercial Museum, Philadelphia.

Apr. 24-27, National Packaging Exposition, sponsored by the **American Management Association.** Navy Pier, Chicago.

Apr. 25-26, Annual Metal Powder Show. Book-Cadillac Hotel, Detroit.

May 8-19, British Industries Fair. London and Birmingham, England.

Carbide Manufacturers' Grade Recommendations

	APPLICATION	Designation	Adamas	Carboloy	Carmet	Firthite	Kennametal	Talide	Vascoloy Ramet	Wesson	Willey
	CHIP REMOVAL										
Cast Iron, Nonferrous and Nonmetallic Materials	Roughing cuts—cast iron and non-ferrous materials.	C-1	B	44A	CA3	H	K6	C89	2A68	GS	E8
	General Purpose—cast iron and non-ferrous materials.	C-2	A	883	CA4	HA	K6	C91	2A5-2A8	GI	E6
	Light finishing—cast iron and non-ferrous materials.	C-3	AA	905	CA7	HF	K8	C93	2A7	GA	E5
	Precision boring—cast iron and non-ferrous materials.	C-4	AA	999	CA8	HF	K8	C93	2A7	GF	E3
Steel and Steel Alloys	Roughing cuts—steel.	C-5	DD	78C	CA5	T-04, T-89	K2S	S88	EE	WS	945
	General purpose—steel.	C-6	D	78B	CA1	TA, T-89	K2S	S90	EM	WM	710
	Finishing cuts—steel.	C-7	C	78	CA2	T-16	K3H	S92	E	WH	606
	Precision boring—steel.	C-8	CC	831	CA6	T-31	K5H	S92	EH	WH	509
	WEAR APPLICATION										
	Wear Surface—No Shock.	C-9	A	883	CA4	HA	K8	C89	2A68 1WR	GI	E8
	Wear Surface—Light Shock.	C-10	B	44A	CA3	H	K6	C88	2A3 2WR	GS	E12
	Wear Surface—Heavy Shock.	C-11	HD-20	55B	CA10	HC	K1	C8515	2A16 3WR	M	E18
	IMPACT APPLICATIONS										
	Impact—Light.	C-12	RDB	55A	CA10	DC-1 DC-2	K1	C8515	2A3 AW	GS	E12
	Impact—Medium.	C-13	HD-20	55B	CA11	DCX DC-3	K18	C8020	2A16 AX	M	E18
	Impact—Heavy.	C-14	HD-25	190	CA20	DC-4	K25	C7525	2A20 AX AY	M	E25

Note: This chart presents the manufacturer's recommendations for carbides for the uses indicated, and it is not intended as a grade comparison chart. It is not an endorsement of any manufacturer's product nor is it an approved list of sources.

—Courtesy Adamas Carbide Corporation

Ten Commandments for Diamond Tool Conservation

By I. E. Rivkin

Molina Industrial Diamond Company

(1) Size of diamond should be in proportion to size, hardness and grain size of grinding wheel.

(2) Protect diamond against accidental blows when not in use. A short length of rubber tubing will serve the purpose.

(3) Frequent dressings are economical because irregularities to be corrected are small.

(4) Truing device must be rigid and diamond tool properly supported with minimum overhand to avoid vibration.

(5) Diamond cuts should not be deeper than 0.001 in., with wheels turned at proper grinding speed. However, large wheels and threading grinding wheels require reduced speed in truing.

(6) Pass diamond slowly across wheel face for high finish, rapidly for stock removal. Truing a grinding wheel periphery should start at high point as corners are often worn smaller.

(7) Use plenty of coolant if grinding is wet; if dry, dress dry, but allow frequent cooling periods. A hot diamond should never be cooled quickly. Immersion may cause it to crack.

(8) Diamond should be inclined at 5° to 15° toward wheel, pointing in direction of wheel rotation. It should contact wheel slightly below center line, never above it.

(9) Turn diamond frequently to insure continual sharp points and regular wear. If too broad a flat develops, it will press the grain into the bond, producing a glazing effect, and reducing cutting action.

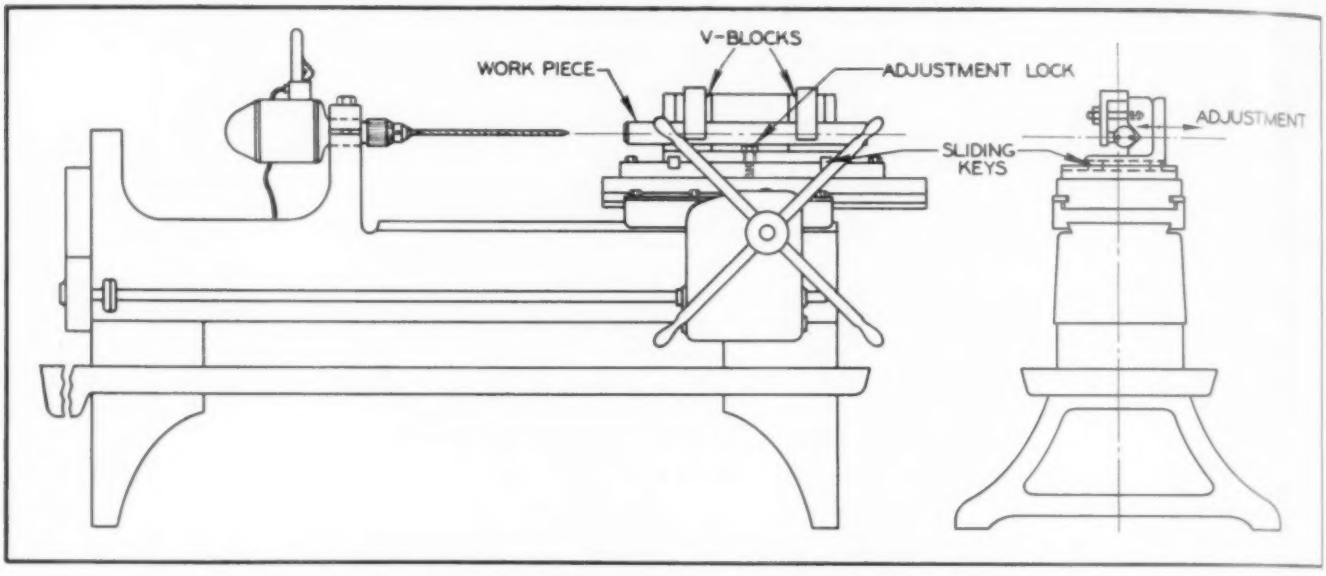
(10) When the exposed part of a diamond is no longer useful, it should be reset.

Presented before Worcester Chapter, ASTE

GADGETS

Ingenious Devices and Ideas to Help the Tool Engineer in His Daily Work

Machine Setup For Deep Offset Drilling



A capstan-mounted V-block fixture and an electric drill "converts" ancient turret lathe for deep hole drilling of pins.

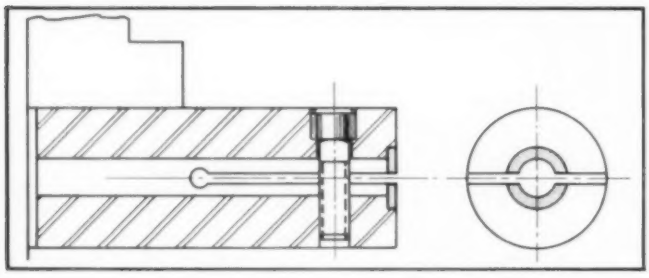
Rather than tie up a production machine for the drilling of deep offset holes in pins, it was decided to convert a belt driven turret lathe of ancient vintage for the operation. This conversion not only obviated an expensive turning fixture but also provided considerable latitude for center-to-center drilling.

Rather than fit the machine with a motor drive, the head-stock pulley was replaced by an electric drill running 750 rpm, the latter providing an ample yet inexpensive source of power to drive the 21/64 in. diameter x 15 in. long drill. Next, the turret was dismounted from the ram, and in its place was mounted a simple V-block fixture.

Sliding on a keyed base plate, this fixture can be adjusted laterally in such manner that holes can be drilled at any desired distance from the center of the part and, naturally, with relation to the centerline of the machine. When drilling, a stub drill is used for starting the holes and is then replaced with the long special drill. A setup such as shown is applicable to a wide variety of jobs, including deep boring.

H. G. Frommer, ASTE Member
Trackson Co., Milwaukee, Wis.

Chuck for Washers



Thin washers, or other short parts, can be held for drilling in a lathe by means of a chuck such as shown.

Small washers that are difficult to hold can be quickly and effectively drilled in a lathe with the use of the simple fixture illustrated. A round piece of cold rolled stock is drilled through and counterbored to form a nest for the washer. It is slotted lengthwise about half way. A cross hole is drilled, counterbored and tapped to receive a socket head clamp screw.

In use, the fixture is chucked directly in the lathe. By tightening the clamp screw, a slight springing action occurs, thus holding the washer securely in place.

Roger Isetts
Kenosha, Wis.

More About Holding Thin Stock

The Gadget Editor:

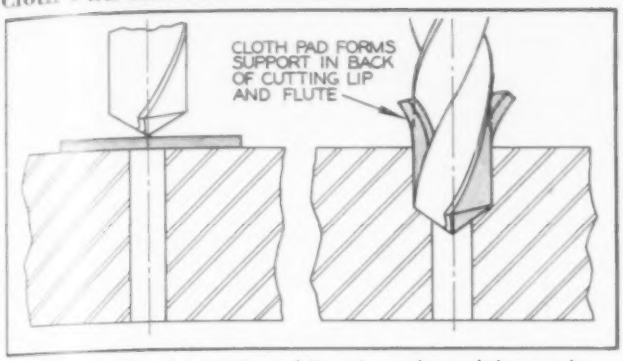
In looking through the October issue, THE TOOL ENGINEER, I was interested to see Mr. P. H. Winter's "gadget" for holding thin stock on a magnetic chuck. However . . . we have obtained Scotch tape with adhesive on both sides, which makes it possible to grind the entire surface of non-ferrous or extremely thin ferrous material without the need of using oversize stock to allow for clamping surface. While not entirely certain, we believe that Minnesota Mining & Mfg. Co. is the manufacturer of this tape.

Robert W. Daly
Boston Chapter, ASTE

While not so stated by Mr. Daly, the natural inference is that the tape is first adhered to the material to be ground, then to the chuck. When grinding very thin stock, therefore, the entire surface must be taped lest it spring away from the grinding wheel. Incidentally, the tape in question is the No. 400, by Minnesota Mining & Mfg. Co. We thank Mr. Daly for the suggested improvement on Mr. Winter's idea.

The Tool Engineer pays regular page rates for accepted contributions to these pages, with a minimum of $5.00 for each item.

Cloth Pad Reduces Chatter



By drilling through a cloth or felt pad, as shown, holes can be enlarged with a twist drill with reduced chatter and digging in.

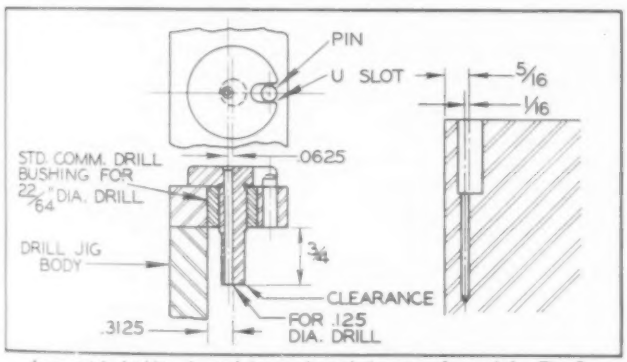
When reworking fixtures or dies, it is sometimes necessary to counterbore or enlarge previously drilled holes. If the right size counterbores or reamers are not immediately available, such alterations can be readily done with a twist drill, without undue chatter, by simply drilling through a cloth or felt pad. The pad should be 3/32 to 1/8 in. thick or more, depending on the size of drill used.

By drilling through the pad, as suggested by the drawing, the cloth or felt forms a support in back of the cutting lips and tends to reduce chatter and digging in. While not recommended as good tool room practice, the method pays off for emergency jobs.

O. C. Steffens
St. Louis, Mo.

Eccentric Drilling Arrangement

A problem involving the drilling of a ⅛ in. dia hole 1/16 in. off center, in a comparatively small-lot production run, was solved by the method suggested by Fig. 1. A section of the workpiece is shown in Fig. 2.



An eccentric bushing, located in angular relation to a larger hole, Fig. 1, left, provides for accurately duplicating eccentrically drilled holes in a workpiece such as shown in Fig. 2, right. (Note dimensional error in drawing:—22/64 should be 21/64.—Ed.)

The body of the jig—Fig. 1—carries a standard commercial drill bushing for the 21/64 in. dia hole. After this hole has been drilled 15/16 is. deep, and bottomed with a flat bottomed drill, an eccentric knurled-head bushing for the ⅛ in. drill is slipped into the standard bushing and angularly located by a U-slot engaging a locating pin.

Clement F. Brown
Willow Grove, Pa.

To Hold Leads in Compasses

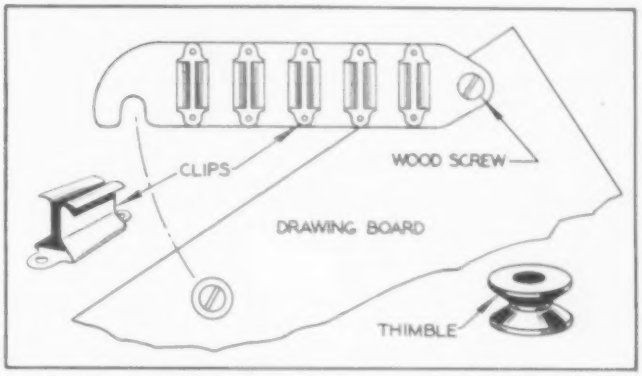
It often happens that, after a period of use, the chucks of compasses or bow pencils either become worn or sprung so that they will not securely hold the lead, which then slips or turns. Rather than tighten the screw until the latter strips, simply run a tap in the hole, the root diameter of which must be less than the diameter of the hole. This will provide a "knurl" which will hold the lead without slipping.

George Hooey
Toronto Chapter, ASTE

Holder for Drafting Tools

Drawings may be kept the cleaner by keeping pencils, triangles, compasses and other tools off the paper or tracing cloth. One method for keeping tools off the board is illustrated herewith.

Take a strip of Plexiglass, about 1½ in. wide x 1¼ in. thick, drill a screw hole in one end and cut a U-slot in the other end, suiting the length of the number of tools most commonly used. To this strip, fasten spring clips as shown, as many as the user may require.



A holder such as shown will keep pencils, triangles and other drafting tools off the drawing paper.

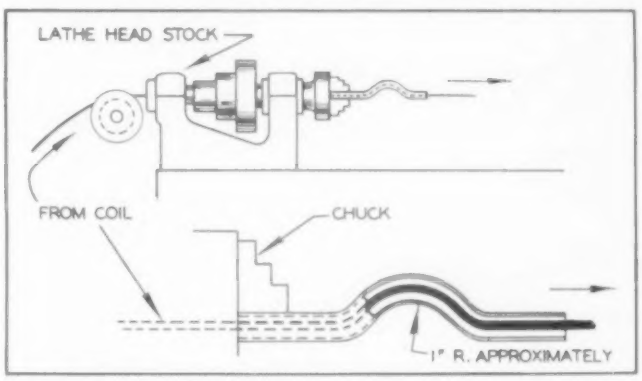
Screw one end of the strip to the upper right hand corner of the drawing board, raising the strip from the board by means of a washer and screwing it down just tight enough to allow swing with some friction. When the strip is parallel with the top edge of the board, locate a thimble, as shown, in the slot and screw down. The holder may now be used as located or swing clear of the board as desired.

No dimensions are stated; however, the illustration conveys the general idea so that draftsmen can make the "gadget" from available material and to suit individual needs. The spring clip can be made from spring brass, bronze or steel, whichever is handy.

Frederich Jerome
Cincinnati, Ohio

To Straighten Coiled Tubing

A simple and inexpensive method for straightening coiled tubing or wire is herewith illustrated. Take a piece of tubing —brass or copper will do—of which the I.D. is about 1/16 larger than the O.D. of the stock to be straightened. Bend as shown and grip is a lathe chuck, making sure not to pinch the tube so that the stock will not enter freely.



Coiled tubing may be straightened by running through a bent tube which rotates in a lathe headstock.

Run the stock through the lathe spindle, perferably over a grooved sheave for guidance. Remove the lathe tailstock and, after threading the stock through the tube, start the lathe and pull the straightened stock through. The method will also serve to straighten coiled rubber stock.

Lester W. Montgomery
Chicago, Ill.

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3108 W. Grace
Richmond 21, Va.

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Charles M. Jenkins, *Chairman*
1229 University Dr., N.E.
Atlanta, Ga.

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Wed. after 1st Mon. *
Andrew J. Jones, *Chairman*
3715 Ridgecroft Road
Baltimore 6, Md.

BINGHAMTON, NO. 35
Wed. after 1st Mon. *
Dean H. Erlenmeyer, *Chairman*
2107 Tracy St., Endicott, N. Y.

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Second Thursday *
Joseph P. Crosby, *Chairman*
38 Highland Ave.
Lexington 73, Mass.

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Gasport, N. Y.

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Advance Service
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6523 Iris Avenue
Cincinnati, Ohio

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Second Friday *
Glenn A. Hier, *Chairman*
8024 Ackley Rd., Parma 9, O.

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2868 N. High St.
Columbus 2, Ohio

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Second Monday *
Gordon Letsche, *Chairman*
146 Hadley Rd., Dayton 9, O.

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Charles Hobbs, *Chairman*
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Decatur, Ill.

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James R. Matthew, *Chairman*
3423 E. 29th Ave.
Denver 5, Colo.

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Third Wednesday*
John M. Speck, *Chairman*
2701 High St.
Des Moines, Iowa

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Second Thursday *
Monta O. Cox, *Chairman*
9562 Longacre Ave.
Detroit 27, Mich.

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First Monday *
Patrick G. Pecoraro, *Chairman*
350 Riverside
Elmira, N. Y.

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Archie E. Weingard, *Chairman*
3012 Wayne St., Erie, Pa.

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Walter P. Schneider, *Chairman*
525 Lewis Ave.
Evansville 14, Ind.

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First Wednesday *
Meredith W. Wilterdink, *Chairman*
RFD #1, Westport, Conn.

FOND DU LAC, NO. 45
Second Friday *
Allan L. McKay, *Chairman*
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Route #1, Algonquin, Ill.

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Coulter Steel & Forge Co.
1498 67th St.
Emeryville, Calif.

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P.O. Box 200, Hespeler, Ont.

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George Gilmour, *Chairman*
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J. K. Smit & Sons, Inc.
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W. Hartford 7, Conn.

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Indianapolis 22, Ind.

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Kansas City 4, Mo.

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Cranston 10, R. I.

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R. Gerald Stronks, *Chairman*
4225 Irving Pl.
Culver City, Calif.

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Second Wednesday *
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3118 Chicadee Rd.
Louisville 13, Ky.

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Vern McFair, *Chairman*
3506 Lake Mendota Dr.
Madison, Wis.

MID-HUDSON, NO. 74
Second Tuesday *
Joseph L. Petz, *Chairman*
11 Meadow Rd.
Poughkeepsie, N. Y.

MILWAUKEE, NO. 4
Second Thursday *
Arthur C. Gudert, *Chairman*
R. #7, Box 150
Wauwatosa 13, Wis.

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Last Tuesday *
Ernest J. Masucci, *Chairman*
141 Genesee St.
New Hartford, N. Y.

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Second Thursday *
Marc A. Cote, *Chairman*
460 Merton Ave.
St. Lambert, Que.

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Second Wednesday *
Charles L. Marker, *Chairman*
1301 S. Beacon St.
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Box 45, Donelson, Tenn.

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Marlin Firearms Co.
P.O. Box 304
New Haven 11, Conn.

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First Monday *
Julius Schoen, *Chairman*
1015 Grand Concourse
New York 52, N. Y.

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First Thursday *
Norman B. Coleman, *Chairman*
13 South Dr.
St. Catharines, Ont.

NORTH TEXAS, NO. 51
Second Friday *
Ephrem L. Minch, *Chairman*
6121 Kenwick
Ft. Worth 7, Texas

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RFD 1, Parsippany Blvd.
Boonton, N. J.

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First Tuesday *
Harold E. Schmidt, *Chairman*
116 Knoxville Court
Peoria, Ill.

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Third Thursday *
Emil Kitzman, *Chairman*
3128 Princeton Ave.
Philadelphia 24, Pa.

PIEDMONT, NO. 82
Second Monday*
J. D. Schiller, *Chairman*
Western Electric Co., Inc.
Chatham Road
Winston-Salem, N. C.

PITTSBURGH, NO. 8
First Friday *
Frank T. Boyd, *Chairman*
1615 Broad St.
Greensburg, Pa.

PONTIAC, NO. 69
Third Thursday *
Cash Bond, *Chairman*
2 Delaware
Pontiac 18, Mich.

PORTLAND (MAINE), NO. 46
Fourth Friday *
Eldon L. Wishart, *Chairman*
63 Glenwood Ave.
Portland 5, Me.

PORTLAND (OREGON), No. 63
Third Thursday*
Lewis R. Ellingwood, *Chairman*
7714 S.E. 17th Ave.
Portland 2, Ore.

POTOMAC, NO. 48
Thurs. after 1st Mon. *
Harry Springer, *Chairman*
220 E. Windsor Ave.
Alexandria, Va.

RACINE, NO. 2
First Monday *
G. W. Christiansen, *Chairman*
2512 Mitchell St., Racine, Wis.

RICHMOND, NO. 66
Second Tuesday *
Paul C. Hermansdorfer, *Chairman*
42 S. 12th St., Richmond, Ind.

ROCHESTER, NO. 16
First Monday *
William R. Gordon, *Chairman*
125 Monteroy Rd.
Rochester 10, N. Y.

ROCKFORD, NO. 12
First Thursday *
Karl B. Kaiser, *Chairman*
1928 N. Rockton Ave.
Rockford, Ill.

SAGINAW VALLEY, NO. 68
Third Thursday *
Harold A. DeVore, *Chairman*
2215 Begole St., Flint 4, Mich.

ST. LOUIS, NO. 17
First Thursday *
William G. Callies, Jr., *Chairman*
Modern Screw Prod. Co.
2307 N. 9th St.
St. Louis 6, Mo.

SAN DIEGO, NO. 44
Second Tuesday *
Glave S. Bunch, Jr., *Chairman*
7884 Broadway
Lemon Grove, Calif.

SCHENECTADY, NO. 20
Second Thursday *
Fred L. Kinum, *Chairman*
General Electric Co.
Bldg. 28—305
Schenectady 5, N. Y.

SEATTLE, NO. 39
Second Tuesday *
Harold R. Pinkerton, *Chairman*
651 W. 51st St.
Seattle 7, Wash.

SOUTH BEND, NO. 30
Second Tuesday *
Paul Beeler, *Chairman*
R. R. #1, Bristol, Ind.

SPRINGFIELD (ILLINOIS), NO. 64
First Tuesday *
William P. Fronmuller, *Chairman*
2420 S. 13th St.
Springfield, Ill.

SPRINGFIELD (MASS.), NO. 32
Second Monday *
Daniel B. Wesson, *Chairman*
55 Stockbridge St.
Springfield, Mass.

SPRINGFIELD (OHIO), NO. 76
Fourth Thursday *
Roy H. Mumma, *Chairman*
738 Patrick Rd.
Springfield 52, Ohio

SYRACUSE, NO. 19
Second Tuesday *
Fay Adkinson, *Chairman*
108 Hillsboro Pkwy.
Syracuse 3, N. Y.

TOLEDO, NO. 9
2nd and 4th Wednesday *
Rolland H. Mogle, *Chairman*
3722 Leybourne Ave.
Toledo 12, Ohio

TORONTO, NO. 26
First Wednesday *
Frederick J. Crook, *Chairman*
104 Thompson Ave.
Toronto 18, Ont.

TRI-CITIES, NO. 23
First Wednesday *
Donald A. Wangelin, *Chairman*
2042 43rd St., Rock Island, Ill.

TWIN CITIES, NO. 11
First Wednesday *
Raymond L. Martin, *Chairman*
4248 10th Ave. S.
Minneapolis 7, Minn.

TWIN STATES, NO. 40
Second Wednesday *
Lee M. Davis, *Chairman*
61 Elm St.
Springfield, Vt.

WATERLOO AREA, NO. 79
Fourth Wednesday*
Glenndon Hilge, *Chairman*
1362 Jewett
Ann Arbor, Mich.

WESTERN MICHIGAN, NO. 38
Second Monday *
John T. Maghielse, *Chairman*
1430 Garfield N.W.
Grand Rapids 4, Mich.

WICHITA, NO. 52
Second Wednesday *
William F. Grabendike, *Chairman*
406 N. Bluff, Wichita, Kansas

WILLIAMSPORT, NO. 49
Second Monday *
Edwin H. Sears, *Chairman*
1356 Mansel Ave.
Williamsport, Pa.

WINDSOR, NO. 55
Second Monday *
William A. Thomas, *Chairman*
Ford Motor Co. of Canada, Ltd.
Tool Design Dept., Plant 2
Windsor, Ont.

WORCESTER, NO. 25
First Tuesday *
Carl D. Schofield, *Chairman*
1 Reynolds St.
Worcester 6, Mass.

* CHAPTER MEETING NIGHT

Photo courtesy Philadelphia Convention and Visitors Bureau

If Benjamin Franklin could rise from his marble dais in the Philadelphia Institute bearing his name, he'd visit the ASTE Industrial Cost-Cutting Exposition to catch up on advances in mechanical arts since his day.

A. S. T. E. NEWS

By Doris B. Pratt

New Ways to Slash Costs Cram 21 Papers Scheduled for Philadelphia Convention

Exposition and Plant Tours to Demonstrate Latest Industrial Techniques
April *Tool Engineer* Will Carry Full Show Guide and Convention Program

AS A SIDELINE to his scientific and publishing activities, Benjamin Franklin once designed a stove, still used, to cut fuel costs and increase heat production. Refusing to patent his invention, he printed a pamphlet explaining the principles and merits of this early space heater, that it might be free to all the people.

How the old Philadelphia physicist would gasp at the cost-cutting production techniques to be given to world industry at the Tool Engineer's Industrial Exposition and the ASTE 18th annual meeting at Convention Hall in his adopted city, April 10-14.

What would terms like automation . . . micro-drilling . . . Marform drawing . . . metamics . . . cold extrusion . . . investment casting . . . nitriding . . . element time data . . . mean to this daring experimenter with electricity? What do they mean to you?

They can mean dollars and cents lopped off the price of your company's product after you see them demonstrated at the show and hear them discussed in the 18 technical sessions being planned by the Society's National Program Committee. This extensive technical program is under the direction of Fred J. Schmitt of Chicago, program chairman, Kenneth W. Riddle, Philadelphia member of Mr. Schmitt's committee, and Frank W. Wilson of Society headquarters, Handbook editor and technical director.

Top billing goes to Automation, with three papers devoted to mechanical handling and feeding of workpieces at the machine and between adjacent machines. Tool engineers will learn how it affects turning and grinding, and press work. The other phase concerns design of ingenious feeders for assembling medium to tiny parts which do not naturally orient themselves.

Spectacular savings—as high as 50 percent—in producing formed sheet metal parts are claimed for Marform metal drawing. Never before given complete editorial treatment, this new process will be fully discussed before the Society.

Manufacturers wrestling with high temperature services requiring strengths exceeding those of pure ceramics will send their engineers to the session on Metamics—a composition of ceramics and metal powders.

And problems in processing metals resisting extreme heat will be answered in a paper on machining and fabrication of high-temperature alloys as applied in jet engine work.

If you have occasion to drill holes as small as 1/1000 of an inch in diameter, then the lecture on micro-drilling is a must. This operation employs machines using neither chuck, collet, spindles nor bearings, as conventionally conceived.

Most of the talks will be illustrated with slides or motion pictures, including two color-sound films being produced

especially for the ASTE convention.

In personally contacting the speakers, Mr. Wilson has toured their respective plants, discussing items to be included in their talks. In these visits, he reports seeing processes never before publicly described.

Day-by-day the technical sessions line up as follows: Monday afternoon, April 10, Developments in Pressworking of Metals—Forming Sheet Metal by the Marform Process, Carbide Die Developments; Cold Extrusion of Metals.

Tuesday morning, Design and Use of Diecasting Dies; afternoon, Machining and Fabrication of High Temperature Alloys, and Automation in Turning and Grinding; evening, Trends in Drilling—Application of Special Drill Units, and Micro-Drilling; Machinability.

Wednesday morning, Metamics; afternoon, Automation in the Press Room, Cold Roll Forming of Metals; evening, Use of Element Time Data for Effective Tool Design, and Tooling Up for Modern Truck Engine Production.

Two Papers on Hard Surfacing

Thursday morning, Hard Surfacing of Production Tools and Gages—Nitriding of Tools and Gages, Hard Chrome Plating; afternoon, Broaching Applications for Cost Reduction, Automation in Hopper Feeds for Assemblies.

Friday morning, Design Economics; afternoon, Investment Casting, and Effect of Latest American Standards on Spindle Deflections.

To demonstrate actual applications of some of the processes and methods featured at the convention and show, a number of local manufacturers are opening their plants to the Society.

Among those offering conducted tours are: Baldwin Locomotive Works, The Budd Co., Campbell Soup Co., Crown Can Co., Link-Belt Co., Philco Corp., SKF, Inc., Westinghouse Electric Corp., Yale & Towne Mfg. Co., and RCA.

One of Philadelphia's best known industrialists will address the annual banquet and national membership meeting at the Bellevue-Stratford Hotel, Thursday evening.

To Elect Officers, Directors

That morning chapter representatives will congregate in the House of Delegates to elect a board of directors. The incumbent board will meet the same day to transact a heavy agenda of business and to elect national officers. Several national committees also are conferring during the convention to plan their future programs. These business meetings will take place at the Benjamin Franklin Hotel.

Official notice of the annual meeting, full program information, show invitations and registration cards, and hotel reservation forms are being mailed to the entire membership. The latter are also available from the Housing Bureau, American Society of Tool Engineers, 17th and Sansom Sts., Philadelphia 3, Pa.

* * *

Meanwhile more than 300 leading manufacturers are busy preparing displays of new or vastly improved industrial production equipment, processes or services. Deep secrecy will surround many of these innovations right up until the time they are unwrapped at the ASTE show.

While the exhibit area on the original floor plan is practically sold out, additional space can be released to the Society if necessary.

The exposition will open each day at 9:00 a.m. and close at 5:00 p.m., leaving evenings free for technical sessions.

For detailed information on the show, program and the convention city, read your March *ASTE News*.

Program, Exhibit Guide in *T.E.*

Scheduled for publication on the 3rd of the month, the April *Tool Engineer* will be approximately triple the size of an average issue. It will incorporate the official convention program and exhibit guide. Each visitor will receive a copy when he registers at Philadelphia.

The exposition data will include an alphabetical listing of exhibitors, their space numbers, products shown, and company personnel in attendance. Products will also be cross-listed according to the Society's numerical indexing system used on ASTE data sheets.

Each exhibitor's featured product will be illustrated and described in the *Tools of Today* section.

In addition the show edition will include preprints of papers to be presented at the technical sessions. This will be the biggest issue *The Tool Engineer* has ever published.

Since the listing of 267 exposition exhibitors in the January *ASTE News*, 51 other companies have reserved booths. They are: Airborne Accessories, Hillside, N. J., Air-Speed Tool Co., Los Angeles, Calif., Allegheny Ludlum Steel Corp. and Gulf Oil Co., Pittsburgh, Pa., Alpha Corp., Greenwich, Conn., American Pullmax, Illinois Tool Works, Walsh Press & Die Co., Western Felt Works, Magnaflux Corp., Armstrong-Blum Mfg. Co., Procunier Safety Chuck Co., and Joseph T. Ryerson & Son, Inc., all of Chicago, Ill.

B. C. Ames Co., Waltham, Mass., The Carborundum Co., Niagara Falls, N. Y., Cleveland Industrial Tool Corp., Euclid, Ohio, Clinton Machine Co., Clinton, Mich., Fenn Mfg. Co., Hartford, Conn., Foster Mfg. Co., St. Louis, Mo., L. H. Gilmer Co. Div. U. S. Rubber Co., U. S. Department of Commerce and Heintz Mfg. Co., Philadelphia, Pa.

Hanchett Magna-Lock Corp., Big Rapids, Mich., Kaufman Mfg. Co., Manitowoc, Wis., M-B Products Co. and Bokum Tool Co., Inc., Detroit, Mich., Sutton Publishing Co., Inc., New Hermes Engraving Machine Corp., Rudel Machinery Co., Oakite Products, Inc., Socony-Vacuum Oil Co., Inc., and Versa-Mil Co., all of New York City.

* * *

Production Machine Co., Greenfield, Mass., Rahn Granite Surface Plate Co., Dayton, Ohio, Todd Co., Inc., Rochester, N. Y., Trabon Engineering Corp., Huebner Publications, Webber Gage Co. and Graham-Mintel Instrument Co., Cleveland, Ohio, Tubular Micrometer Co., St. James, Minn., Western Tool & Mfg. Co., Springfield, Ohio.

Benzon Machine Co., Lansdale, Pa., W. F. Meyers Co., Bedford, Ind., Edwin B. Stimpson Co., Inc., Brooklyn, N. Y., Apex Tool & Cutter Co., Inc., Shelton, Conn., Firth-Sterling Steel & Carbide Corp., McKeesport, Pa., Schramm, Inc., West Chester, Pa.

Sheffer Collet Co., Traverse City, Mich., Torkarm Corp., Minneapolis, Minn., The Van Keuren Co., Watertown, Mass., and Watson-Flagg Machine Co., Inc., Paterson, N. J.

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Chapter listings include member as well as meeting news.

Allentown Area T.E.'s Organizing ASTE Chapter

Allentown, Pa.—Like widening ripples from a pebble tossed into a pool, the contagious enthusiasm of ASTE members keeps spreading into new areas.

Albert Carney of Carney & Associates, Ltd., Allentown, became so imbued with the ardor of an ASTE relative that he began to talk ASTE to local confreres.

As a result 150 men gathered January 20 at the Traylor Hotel to consider forming a Lehigh Valley chapter of tool engineers.

After a brief reception Eugene Pelizzoni of Mack Mfg. Co., Allentown, opened the meeting. Mr. Pelizzoni had been asked by Mr. Carney to serve as chairman pro-tem. Other temporary officers are: George Evanson of General Electric Co., secretary; and E. A. Kromer of Western Electric Co., treasurer, both of Allentown.

As representatives of the national society, H. E. Conrad of Detroit, executive secretary, and H. B. Osborn, Jr. of Cleveland, national membership chairman, explained the principles and aims of ASTE. They set forth the advantages of a local chapter to individual members and to industry. Approximately 90 of those present indicated immediate interest in becoming affiliated with ASTE and in forming a chapter.

Principal speaker was Thomas J. Donovan, ASTE director from Philadelphia who has been aiding the Allentown group in its organization efforts.

Mr. Donovan presented his nationally-known "Silver Dollar Quiz." Bombarding the audience with questions concerning tool design, die setup, mechanical problems, steel selection and heat treatment, Mr. Donovan passed out silver dollars for correct answers and 50-cent pieces for half-right guesses.

At the conclusion of the program the production men enjoyed a social hour and refreshments.

The Lehigh Valley group, expected to be chartered February 17, will be the fifth new chapter added to the Society roster during the past six months.

The Allentown area includes such industrial towns as Reading, Stroudsburg, Emmaus and Bethlehem, Pa., and Phillipsburg, N. J. It represents makers of steel and manufacturers of electrical appliances, electronic equipment, instruments, air compressors, pumps, motion picture machinery, steam specialties, automotive vehicle stampings and other specialized products.

Wishing you Joy and Happiness

FOR CHRISTMAS
AND
THE NEW YEAR

PIEDMONT CHAPTER
American Society
of
Tool Engineers

Let's Start The New Year
right by attending

January Meeting

MONDAY 9th

Dinner Meeting 6:30 p. m.
Technical Session 7:45 p. m.

Robert E. Lee Hotel, Salem Room

Technical Subject

Techniques of Magnesium Fabrication & Manufacturing Processes

by

Mr. J. S. Kirkpatrick, Superintendent of Research & Development

Brooks & Perkins, Incorporated
DETROIT, MICHIGAN

Our Society

By H. E. Conrad

Did you realize as you were reading the January issue of *The Tool Engineer* that it was a history-making issue? It was the very first issue of the magazine published by the Society completely independent of any outside publishing help. In other words the only thing that's not done right out of the Society's headquarters in connection with publishing the T.E. magazine is the actual printing and engraving.

I would be very much interested in any comments from members on the first issue as well as succeeding issues. From my own point of view I think those on our staff responsible for the T.E. magazine are deserving of a lot of credit for the exceptionally smooth changeover and an all 'round good job. It isn't an everyday occurrence to take over the responsibility of publishing a magazine without at least one major mishap. One would have to look far and wide to find a better article on Hydraulics than the one in the January issue and for that matter the rest of the editorial content is much above the average found in leading technical publications. We can be justly proud of our magazine.

Developed by Former Publishers

To look back on the history of our magazine we must acknowledge the contributions that have been made by both our previous publishers—Roy Bramson and Bob Powers. In looking to the future I can assure you of continued improvement and development of this all-important activity.

The convention and show programs are developing in fine shape and it may be that you will have received all of the information in the mail before this issue of the magazine comes off the press.

Hotel room reservation forms and other material are due for release as soon as received from the printer and please don't put off filling in and sending the various forms back. From all advance indications the Philadelphia convention and show will be the best attended and outstanding in every respect.

In conclusion I want to acknowledge the splendid cooperation we are getting from everybody—members, exhibitors and industry at large and last but not least the boys of the Philadelphia chapter—Thanks a million.

Schiller Named Chairman

J. D. Schiller, former chairman of Greater New York chapter, was installed as chairman of Piedmont chapter during recent chartering at Winston-Salem. Other officers and honor guests were, from left, seated: H. B. Osborn, Jr., national membership chairman; Harry Krutz, general manager, Winston-Salem Chamber of Commerce; J. J. Demuth, second vice-president, ASTE; Mr. Schiller; H. E. Conrad, executive secretary, ASTE; P. H. Hanes, Jr., president, Winston-Salem C. of C.; standing: K. T. Speer, chief machine designer, R. J. Reynolds Tobacco Co.; Mebane Turner, chairman, Piedmont Section, ASME; and James G. Fraser, vice-president, J. W. Fraser Co., Charlotte, N. C. Below: Center spread of attractive holiday greeting Piedmont used to announce January meeting.

Top, left: Rockford chapter officers are greeted by their plant tour hosts at the Allis-Chalmers Mfg. Co. in Milwaukee, Wis. From left: John Breutzman, Rockford Allis-Chalmers representative and chapter reservation chairman; George Rigeman, first vice-chairman; Karl Kaiser, chairman; and plant representatives who made tour arrangements. Right: Three members study small model of a 24-million volt betatron manufactured by Allis-Chalmers. Below: The Rockford visitors arrive at the company clubhouse where they were luncheon guests.

Rockford Sees Giant Machines Processing Power Units

Rockford, Ill.—Some 45 Rockford members journeyed to West Allis, Wis., recently to watch massive machinery handle and process power plant, mining and manufacturing equipment at Allis-Chalmers Mfg. Co.

After lunch at the company clubhouse, the ASTE party separated into small groups escorted by guides. The tour began in the pattern shops, where both wood and metal patterns are built for all sizes of castings. Since the company has kept all patterns for possible future use, storage presents a problem. The pattern inventory is valued at about $6 million.

The groups then visited the physical test lab in the research building and observed testing machines for determining strength of metals.

Next on the itinerary was the centrifugal casting department. Here five high-frequency induction furnaces turn out the varied types of nonferrous castings required in Allis-Chalmers products. Graphite molds assure dense and nonporous castings.

Hydraulic Stream Cleans Castings

In one foundry castings as heavy as 135 tons are poured. For turbine housing castings loam molds are employed. This type has a brick foundation. A sweep establishes the right contour and steel reinforces the outside of the mold. For tractor blocks and transmission housings, mechanized molding units follow the production line technique.

Of especial interest was the 35-foot high hydraulic water blast which cleans large castings. Water, forced through six nozzles under 450 pounds pressure, is directed at the castings as they move on a turntable.

On the four-story high erection floor running north and south, all materials flow in parallel lines from nine machine shops extending from east and west. This eliminates backtracking. Here hydraulic turbines, mine, sawmill, and paper mill machinery are assembled and centrifugal pumps are tested. About 18 months is required to process a turbine through the shop, a guide stated.

Moving to the end of this floor, the engineers looked over a 40 x 16 foot vertical boring mill, claimed to be the largest in the Western Hemisphere. The million-pound machine, capable of turning or boring a job 40 feet in diameter, is scheduled to capacity for more than two years, 20 hours a day, seven days a week.

Designs Own Stator Bender

In another shop stators for generators were being wound and bent. A company-designed machine bends the already-taped, smaller stators into their intricate shape for insertion in the generator. Large stators are bent over wood frames by hand.

Five men were working as a team in the forge shop. As a piece 15 feet long and 1½ feet in diameter was shaped, one operator worked the controls of the steam hammer and two men guided the large hand tools. An overhead crane operator controlled the free end of the rough shaft, while the fifth man positioned the forging under the table of a 2500-ton hammer. The forging was held between jaws which were free to rotate.

By the time the out-of-towners had toured these and other departments, the afternoon was gone and everyone was tired. Limited time prevented visits to other divisions.

During the return bus trip the Rockford tool engineers stopped for dinner.

Providence Learns How Local Product Is Made

Providence, R. I.—Walter Buerckel, sales engineer for the Nicholson File Co., Providence, addressed the first 1950 meeting of Little Rhody chapter at Oates' Tavern, North Providence, January 5. His subject was "Manufacture and Use of Files and Rasps, and Specialized Problems."

After discussing file making from steel selection, through machining and cutting, to the fine art of hardening, Mr. Buerckel explained how to choose and use files and rasps.

In a business meeting the members elected Wilfred Pender, Henry Houle and Carl Klockars to serve as Nominating Committee. Chairman Delbert Krahnke was appointed chapter delegate.

Other business included a report of the Christmas party, introduction of new members and the reading and approval of the semi-annual report from headquarters.

* * *

In December the usual technical meeting gave way for the annual Christmas party, held on the 10th at Oates' Tavern.

Morosini Is Guest M. C.

Fred Kunath, program chairman, was in charge of arrangements, assisted by Chairman Krahnke. John Morosini of Boston chapter was master of ceremonies and "Happy" Stanley and his orchestra provided music.

After a reception that put everyone in a holiday mood, the 215 members, wives and guests sat down to dinner. Throughout the meal Happy roamed about as a strolling minstrel in keeping with the occasion.

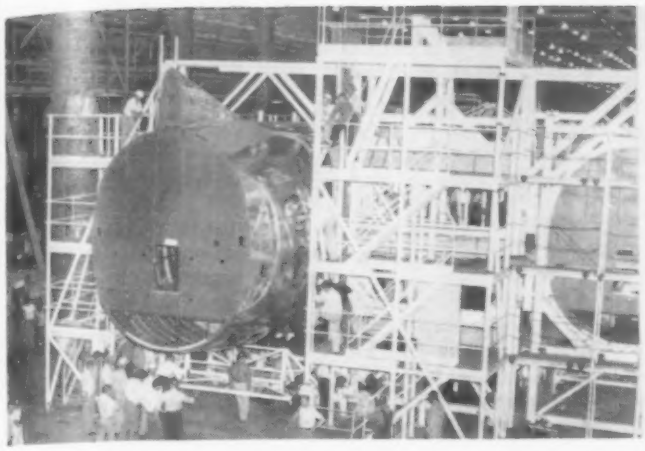
Each lady found a gift at her place. Mr. Krahnke thanked members and concerns who had contributed prizes and presents for the party, before distributing these awards.

Several members added to the fun with an amateur entertainment and the party continued with dancing.

Named Sales Manager

Cincinnati, Ohio—Bertram Workum, treasurer of the Cincinnati ASTE chapter, has been appointed sales manager of Cincinnati Metalcrafts, Inc.

Mr. Workum formerly was associated with the Cincinnati Supply Co. as sales engineer.



Left: High spot in recent Los Angeles chapter tour of Douglas Aircraft plant was this three-story jig from which C-124 prototype fuselage is emerging. Right: First three C-124's on the line are from rear: prototype, static test model with short wing, and first production model being joined to wing.

Aluminum Processing Film Shows Extruding, Drawing

Utica, N. Y.—Approximately 30 members of Mohawk Valley chapter heard C. J. Plovanich, assistant sales manager, magnesium aluminum products, Revere Copper & Brass, Inc., talk on "Aluminum, Its Alloys, Properties and Applications" at the December 20 technical meeting. The session was held at the chapter quarters in the Moose Home. E. J. Masucci, chapter chairman, presided and introduced the speaker.

Mr. Plovanich began by showing a motion picture of the processing of aluminum tubing and extruded shapes. One exceptionally interesting highlight featured extruding a billet and successive stages in drawing tubing. Other sequences covered extrusion of aluminum in varied shapes.

The speaker talked precisely on types of aluminum containing physical properties for specific applications. Heat treatment was also discussed in detail. Mr. Plovanich concluded by summing up the wide variety of applications in which aluminum is now employed. After the lecture he answered questions from the floor.

L.A. Men Watch Giant Jig Join Fuselage Assemblies

Los Angeles, Calif.—December meeting of Los Angeles chapter was held at the Long Beach plant of Douglas Aircraft Co., Inc.

The Douglas plant, which produced thousands of B-17's and C-47's as well as several hundred A-20's and A-26's during the war years, was host to 200 chapter members and guests the evenings of December 8 and 9.

After dinner in the plant cafeteria, the sightseeing groups were escorted through the plant by members of the administrative staff of the tooling departments. The visitors saw steps involved in tooling and producing parts and assemblies for the giant new C-124 Transport.

Of especial interest to the tool engineers were the highly specialized milling machines for machining wing spar caps from extruded 75 ST Dural billets. The ASTE men lingered also over plaster patterns and fabrication of drop hammer dies.

The center wing section moving line demonstrated a 100-foot aircraft assembly. But the sightseers were more amply rewarded for their long walk when they reached the final assembly line and watched a three-story jig joining major sub-assemblies of the fuselage.

The tour was under the direction of E. J. Van Wagner, supervisor of tool design at the Long Beach plant, and a member of the L. A. chapter council.

G. E. Engineer Details Electric Motor Making

San Francisco, Calif.—Carl Anderson, plant engineer of General Electric Co., San Jose, was the speaker at the November meeting of Golden Gate chapter. His subject was "Plant Layout and Motor Manufacturing."

All phases, based on progressive manufacturing and inspection, were fully covered. The question period following Mr. Anderson's talk evidenced keen interest in this subject.

The meeting was held at the Union League Club with 110 present.

Stainless Steel Forms Own Protective Coating

Poughkeepsie, N. Y—When exposed to the atmosphere, stainless steel automatically forms a corrosive resistance film on the surface. If the film is destroyed, it will reform within 20 minutes to two hours.

George C. Kiefer, associate director of research for Allegheny Ludlum Steel Corp., emphasized this property of the chrome-alloyed steels during a lecture before Mid-Hudson chapter at Nelson House, December 13.

But in order to permit this protective film to form, he pointed out, the surface must be clean and free from scratches. While a polished surface assumes a passive condition quicker than a rolled surface, the film formation can be speeded up by using an acid with a high oxidation content.

Illustrating with lantern slides, the internationally known authority on corrosion and metallurgical chemistry, described the various chrome families developed since the introduction of stainless steel in 1923.

Names Free Machining Types

He cited the 12 percent chrome group —403, 405, 410, 413 and 416—as the most widely used. In the 18 percent chrome, 8 percent nickel classification, are the free machining types. These steels, 301, 302, 303, 304, 309 and 310, machine as easily as ordinary steels, the speaker stated.

Following his talk Mr. Kiefer showed two sound films, the first comparing the protectively coated stainless steel with ordinary steel and gold, and the second showing steps in melting and refining stainless steels. A question period followed.

Charles O'Donnell, former city attorney, gave a coffee talk on "City Government and Financial Troubles." Present fiscal difficulties of cities, said Mr. O'Donnell, stem from the lack of private building during the war, depriving municipalities of increased tax revenue to offset mounting expenses.

Joseph L. Petz, chapter chairman, presided at the meeting.

Eliminates Statistics In Quality Control

Boston, Mass.—Statistics are unnecessary in establishing a system of quality control as a production tool, in the opinion of Leonard A. Seder, chief quality control engineer of the Gillette Safety Razor Co., Boston.

The whole inspection problem, Mr. Seder told 155 Boston chapter members and guests, can be broken down into simple, graphic pictures which indicate at a glance to an experienced man whether or not the process is proceeding normally.

A national director of the Society for Quality Control, Mr. Seder discussed quality control before the Boston ASTE men at a dinner meeting, December 8, in New England Mutual Hall.

With a visual chart the speaker demonstrated the concept of variation and natural frequency distribution and showed the limits derived from any process capability.

Error of measurement he named as one of the greatest bugaboos. It is vital to determine all of the facts, he emphasized. A showing of results of tests run off on a broaching machine concluded Mr. Seder's lecture.

"Cavalcade of Sports," a Gillette film, was shown before the technical session.

Chairman Joseph Crosby presided and Program Chairman A. J. Leone presented Harry F. Phipard of his committee as technical chairman of the evening.

Screw Machine Film Premiered at Elmira

Elmira, N. Y.—The premiere of a new motion picture on screw machine applications was viewed by Elmira members at a meeting December 5 at Mar Twain Hotel.

A. R. Sparrow, chief tool engineer of screw machines, Brown & Sharpe Manufacturing Co., presented the film and the accompanying lecture. Attachments a tools for various operations were shown and explained.

An additional film demonstrated these machines engaged in ballpoint pen manufacture.

Cites Factors Affecting Sheet Metal Fabrication

Galt, Ont.—Grand River Valley chapter met December 13 at the Royal Hotel, Guelph, for its second technical program and dinner. Approximately 75 members and friends were present.

In the absence of Harry Whitehall, chapter chairman, Harry Sehl, vice-chairman, presided. John Ward, program chairman, introduced the speaker, C. J. Connoy of General Steel Wares, Toronto.

Discussing "Pressed Steel Work and How It Affects the Tool Engineer," Mr. Connoy held his audience at attention with detailed experiences in sheet metal work. In each case he showed samples of the problem parts.

Know Performance Requirements

"The main theory," said Mr. Connoy, "behind successful forming of complicated parts is in knowing quantity and quality requirements of the finished product, in addition to choosing a metal with suitable physical characteristics for maximum operating requirements. Of course," he added, "there are other factors entering into each picture. Safety, proper die setting, handling precautions, and a thorough knowledge of the work being done all contribute to a good finished product."

In a subsequent open discussion he answered numerous questions for his keenly interested audience. Charles Spicer thanked the speaker for his talk.

* * *

Nearly 100 tool engineers responded to the announcement of the first post-charter meeting, held November 8 at the Grand River Valley Golf and Country Club in Bridgeport.

Chairman Whitehall welcomed the gathering and plotted chapter objectives and plans. Everyone, he urged, should participate in committee work.

Guest speaker was Otto Winter, president of Acme-Winter Corp., Buffalo, N. Y., and a former president of ASTE.

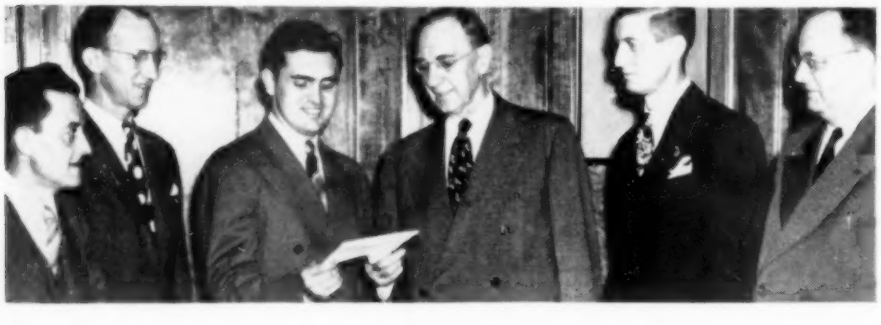
In a dynamic address, "Destiny of Tool Engineers," Mr. Winter stressed the tool engineer's importance in industry and the benefits society is reaping through his untiring efforts and endless ingenuity. Mr. Winter reminded his audience of the advancement in mechanical methods and ultra-modern production devices and equipment brought about by the tool engineer during the war and since.

"The allied victory in this last great conflict was definitely foreshortened by you," said Mr. Winter.

In appreciation of his talk, the chapter presented a gift to the speaker. A social hour and refreshments followed adjournment of the meeting.

Columbus Awards Ohio State Student $300 Scholarship

Howard L. Bevis, president of Ohio State University, presents a $300 scholarship to Robert J. Owen, student in the tool and production areas of the industrial engineering department of the university. This first annual scholarship of the Columbus ASTE chapter was awarded during the chapter's Christmas party, December 9, at the Fort Hayes Hotel. From left are: Jay Edmondson, national education chairman; Kenneth R. Armagost, Columbus chapter chairman, Mr. Owen and President Bevis, Thomas F. Starkey, vice-chairman of the chapter; and Dr. P. N. Lehoczky, chairman of industrial engineering, Ohio State University.



Gairing Again Heads Cutting Tool Makers

Detroit, Mich.—Emil Gairing, president, Gairing Tool Co., was re-elected president of the Cutting Tool Manufacturers Association at the organization's sixth annual meeting here, December 6.

Also re-elected were Vice-President Norman Lawton, works manager, Star Cutter Co., and Treasurer R. S. Spencer, president, Detroit Boring Bar Co.

Harry J. Merrick, who was reappointed executive secretary, passed away suddenly six days later. A successor to Mr. Merrick is to be announced.

Mr. Gairing was also voted in for another three-year term as director, along with E. A. Goddard, president, Goddard and Goddard Co.

Serving on a newly-formed social activities committee are R. G. Michell of Eclipse Counterbore Co. and Walter Fuller of Fuller Tool Co.

All of these officers are members of the Detroit ASTE chapter, as was Mr. Merrick.

It Didn't Get Away

Winter fishermen trolling southern waters for big, finny game have nothing on Warren B. Reynolds, chief inspector at the Mason-Neilan Regulator Co., Boston, and a charter member of the ASTE chapter there. An ardent Walton disciple, Mr. Reynolds usually brings home a fine string of lake fish. But last summer he tried deep sea fishing and pulled this 623-lb tuna out of the Atlantic Ocean about six miles off Newburyport, Mass., after a three-hour battle.

Panczner Named V.P.

Philadelphia, Pa.—E. H. Panczner, until recently division manager for P. R. Mallory Co., Inc., Indianapolis, has joined Paul & Beekman, Inc., Philadelphia, as vice-president and works manager.

Mr. Panczner was also named a director of this and another Philadelphia firm, Conestoga Mfg. Co.

A former member of Indianapolis chapter ASTE, he is now affiliated with the Philadelphia Tool Engineers.

Left: Karl Kaiser, Rockford chapter chairman, presents a 15-jewel wrist watch to a Mrs. Fricke, winner of the top door price at the chapter's ladies night. Center: Major Paul Cyr thrills ladies night audience with his experiences as an American spy. Right: Edmund Mansure of the Illinois Manufacturers Association charges taxpayers with laxness in permitting government extravagance and waste.

Voters Let Taxes Drain Investment From Industry

Rockford, Ill.—To create an average job in American industry, more than $8000 in capital investment is needed. Every $8000 taken from the people by the government prevents an investor from making a job for one man for from 10 to 20 years. When investment drops, production drops. When production drops, workmen walk the streets.

Edmund F. Mansure, president of the Illinois Manufacturers Association and of the E. L. Mansure Co., laid these facts before about 100 Rockford ASTE'ers and their guests during his address, "The Plague and I," at the annual executives night held recently at the Lafayette Hotel.

If the excessive and unwarranted extravagances of government could be stopped, Mr. Mansure went on, then taxes could be reduced and prices lowered. The Federal government's expanding power and scope influences the fate of business and all of us individually every day.

Scores Voters' Apathy

Big government, he charged, is more dangerous than big business, and yet the American public shows a very definite lack of interest in electing persons to the offices controlling all this power and money.

Only 51.8 percent of the potential voters, the Illinois industrialist quoted, exercised their franchise in the last presidential election. He cited cases in which members of Congress were elected by only two out of five of the potential voters in one instance and by only one out of 16 in another.

In commenting on prospective pension plans, Mr. Mansure pointed out that if $100 pensions were granted to the 11 million people now 65 or older, the cost would be $13 billion a year. The full administration plan of health and welfare would amount to $21 billion annually, or 15 percent of all payrolls.

Nearly everyone, he stated, is a part-time government worker because of the high tax rate. One-fifth of the national income goes for taxes—taxes that are hidden in the price of everything we buy.

In closing, Mr. Mansure urged that each individual citizen assert himself, take an active interest in local government and know what is going on that affects him.

As coffee speaker, Harry Conrad, executive secretary of the Society, brought a greeting from the national organization. Mr. Conrad read the president's report to the directors.

Spy Reveals Exploits

The adventures of an American spy thrilled 160 persons attending the chapter's ladies night, December 7, at the Lafayette Hotel.

Major Paul Cyr, one of General "Wild Bill" Donovan's cloak and dagger boys, highlighted the holiday party with an account of his experiences as one of the first Americans to be dropped behind the German lines in France during World War II.

A former newspaper man, Major Cyr was rigorously trained in this country to assume the role of a French journalist as a member of the OSS.

Given one chance in a hundred to come back alive, the daring spy jumped from a plane over France and met a British Intelligence group. For six months before the invasion Major Cyr worked behind enemy lines obtaining information on German defense plans of the south coast of Brittany.

In May of 1945 he parachuted into Japanese territory in China, 350 miles behind the lines. Among other exploits, he blew up the Yellow River Bridge, "the hottest target in China."

Major Cyr expressed definite views on the problem of Communism in the U. S. He told how secrets had passed out of this country through diplomatic immunity. This American spy would like to see teams organized in the manner of the OSS, to ferret out underground movements of the Communists.

The meeting opened with dinner and dancing. Top door prize of a 15-jewel wrist watch went to a Mrs. Fricke. Mrs. George Ford received a bottle of perfume and Mrs. Donald Hawkinson won a fishing hole locator.

Color slides, taken at the previous ladies night, were shown by Jerry Reinertson of Chicago.

John Rice, membership chairman, presented ASTE bronze car emblems to several members for bringing in applicants. Extra rewards of complimentary dinners at chapter meetings are being offered for each two or more members added to the roster.

Newark Aims for Student and Executive Memberships

Newark, N. J.—Northern New Jersey chapter has initiated a long-range plan to enlist recruits who will eventually fill the places of the present membership.

To aid engineering students and interest them in Society affiliation, the chapter through its Education Committee is sponsoring subscriptions to *The Tool Engineer* for local technical schools. Following are those who will receive the magazine for circulation in their school libraries:

Ronald W. Kent, director, and Thomas S. Marshall, supervisor of instruction and teacher trainer, Essex County Vocational School; Rudolf Skrivanek, principal, Essex County Vocational and Technical High School; J. Ernest Jones, acting principal, Essex County Adult Technical School, and William Hazell, Jr., dean, Newark College of Engineering, all of Newark.

Joseph Fair, principal, Essex County Vocational and Technical High School, Irvington, and Joseph Jeffryes, principal of the Bloomfield branch of this school.

In order to acquaint industrial executives and subsequently their staffs with the Society's work, the chapter invited local heads of tool concerns to the December 13 meeting.

Approximately 100 responded, swelling to 300 the audience assembled to hear J. L. Schwab, New England Div. manager, Methods Engineering Council, Bridgeport, Conn., prophesy "The Next Ten Years for the Tool Engineer." Pointing up the tool engineer's role in the production picture, Mr. Schwab emphasized that this profession coordinates the work of all specialists in the tooling field.

Until educational institutions can coordinate actual experience with theoretical training, tool engineers will continue to come from the ranks of practical men for the next 10 years at least, Mr. Schwab estimated. He projected the future of the tool engineering profession as a worthwhile goal for engineering students.

Program plans for the chapter include a dance and reception for late February or early March.

Tool engineers and their wives celebrate eleventh anniversary of Tri-Cities chapter founding, with a dinner and dance on a Mississippi River island.

Aluminum Process Choice Hinges on Speed, Quantity

Montreal, Que.—Costs must be figured carefully to determine whether to use spinning or drawing in aluminum processing, J. W. Lengbridge of Aluminum Goods, Ltd., Toronto, emphasized in a lecture before Montreal members.

If quick delivery is essential, Mr. Lengbridge pointed out during a meeting December 8 in Canadian Legion Hall, spinning is the better method, as there is no waiting for drawing dies and punches. But, if there is a good prospect or reorders and speed of delivery is not a consideration, it may be more economical to set up for drawing.

Spinning is also important to supplement drawing, he observed. It can be used to remove drawing wrinkles, for burnishing drawn shells and for putting necks and bulges on drawn parts.

With slides the speaker showed lathes, tools and chucks used in spinning. Manual skill was stressed as vital since the operator must recognize the feel of the metal flowing on the end of the spinning stick and apply pressure accordingly.

Semi-automatic and fully automatic spinning equipment, Mr. Lengbridge added, can be used on heavy jobs requiring strong pressure. The compound and cross slides of the lathe hold the tools. Two men manipulate the slides to conform with the changing shape of the metal.

The meeting closed with a sound film showing spinning operations and the production of intricately shaped parts.

Chairman M. A. Cote introduced the speaker and T. C. Hill thanked him for an excellent presentation.

Tri-Cities Celebrates Eleventh Anniversary

Moline, Ill.—Tri-Cities chapter marked its eleventh anniversary with a ladies night meeting, December 10. The social event took place at the Ship's Wheel ballroom on Campbell's Island in the Mississippi River, off East Moline.

After dinner everyone participated in community singing. Results of the chapter's recent membership contest were announced and prizes were awarded to those making the best showing in obtaining applications.

W. Z. Fidler received a copy of the "Tool Engineers Handbook" for bringing in the most members. Door prizes also were distributed, both to ladies and men.

Following an hour-and-a-half show put on by local entertainers, the party continued with dancing and fellowship.

Osborn Talks on Heating

Pittsburgh, Pa.—Dr. H. B. Osborn, Jr., technical director of the Tocco Div., Ohio Crankshaft Co., Cleveland, and national membership chairman of ASTE, opened Pittsburgh chapter's 1950 program.

Dr. Osborn discussed "Economy in Production with Induction Heating" before 76 men attending the chapter's dinner meeting January 6 at Hotel Sheraton. The speaker augmented his informative lecture with slide illustrations.

Before the technical session Frank T. Boyd, chapter chairman, conducted the election of a chapter nominating committee.

Giant Machines Process B-47 Bomber Parts

Wichita, Kans.—Huge rolls forming aluminum alloy sheets 5/8 in. thick and millers machining entire sheets of this metal captured the attention of a Wichita chapter group who visited the Boeing-Wichita aircraft plant lately.

In this home of the B-29, now producing the B-47 bomber, the local tool engineers saw also a 5000-ton Hydro-Press and other large capacity machines required to build this type of aircraft.

To climax the tour, company guides showed the party a finished plane representing one of the latest postwar developments.

Prior to the plant inspection trip the group met at Wolf's Cafeteria for dinner and a technical session. James Hill, chapter secretary, discussed "Optical Alignment of Large Jigs." His paper detailed equipment used and general application of this relatively new procedure for setting and maintaining critical points on large jigs.

* * *

December meeting featured J. Y. Riedel, tool steel engineer for Bethlehem Steel Co. Mr. Riedel discussed "Tool Steel Failures—Their Causes and Cures."

After enumerating the most common types, the speaker related the proper procedures to correct or avoid such failures. Slides of actual parts illustrated these points. A company film, "The Making of Alloy Steel," followed the lecture.

Jack Lane, local Bethlehem representative, introduced Mr. Riedel to the 95 members and friends present.

Brazing, Welding Offer Production Shortcuts

Toledo, Ohio—A double-header program sponsored by Toledo chapter, December 14, gave 81 members and guests pertinent data on Furnace Copper Brazing and Unionmelt Automatic Electric Welding.

The first speaker, Lloyd E. Raymond, chief metallurgist of Singer Manufacturing Co., explained fundamentals of copper brazing and types of furnaces required for the process. He cited advantages to be gained where this process can be properly applied.

Frequently, considerable machine work can be eliminated when a part can be made by copper brazing a number of components. Surfaces of such parts are left as clean and bright as before brazing. Because of the fluidity of the copper, pressed fits can be used to join parts before brazing. No flux is necessary to achieve a good bond. Mr. Raymond illustrated his talk with slides and sample parts produced by his company.

M. R. Scott, sales engineer of the Linde Air Products Co., recommended Unionmelt welding as particularly adaptable for parts to be produced in quantity. It may also be used to advantage on parts requiring less complicated fixtures.

Mr. Scott aptly compared the process to pushing a pencil through a pile of sand. The welding rod is fed from a large coil at the proper speed, and a granular flux is deposited just ahead of the moving arc. Flux adjacent to the arc melts, floats on the surface of the molten metal, then solidifies at the top of the weld. Cooling, the flux cracks off leaving a clean, high quality weld. Types of welding heads and operations they perform were shown in slides.

Hall Made Editor

Detroit, Mich.—Stuart P. Hall has been appointed editor of *Design News*, according to an announcement by John Haydock, vice-president and editorial director, Rogers Publishing Co., Detroit.

Associated with this publisher since 1948, Mr. Hall became managing editor of *Design News* last year. Previously he had served on the staff of *Product Engineering* and in the engineering department of Buick Motor Div. of General Motors Corp.

A contributor to the "Tool Engineers Handbook," Mr. Hall is a charter member of Saginaw Valley chapter, ASTE. He is also a member of SAE and the Engineering Society of Detroit.

Mass Production Plant Flourishes in Communal Group

Cedar Rapids, Iowa—The anomaly of industrial mass production, practiced by an idealistic, communal society, was brought home to Cedar Rapids members during a recent tour of the Refrigeration Div. of the Amana Society at Amana. Harold Smith of this division was host for the visit.

Approximately 140 chapter members and guests participating in the tour saw some of the most modern equipment pressing steel and fabricating parts for refrigerator assembly.

Tooling, they observed, was designed for high speed production and accuracy of parts. From raw stores to crating of the finished product, every phase of manufacture in the mammoth plant demonstrated this objective.

After completing the late afternoon tour, the entire group assembled at the Ox Yoke Inn for a home style dinner.

Martin Dickel, accountant for the Amana Refrigeration Div. and a native of Amana, was the after-dinner speaker, relating the origin and development of the society.

Founded near Buffalo, N. Y., by a group of German descent, the Amana Society moved to Iowa in 1855 in order to expand its operations. The 26,000-acre community embraces eight villages, all named Amana with geographical modifications.

Every Member A Stockholder

Everything except clothing and household goods is community property, each member being a stockholder. Self-sustaining, the organization grows or produces all the necessities of life. In addition it manufactures for trade nationally-recognized merchandise such as furniture, woolens and blankets, besides a full line of refrigeration units, the speaker stated.

* * *

Another meeting, held at the Montrose Hotel, Cedar Rapids, featured S. E. Beer of Monarch Machine Tool Co. as technical speaker. Mr. Beer discussed "Latest Developments in the Turning Field," dwelling at length on tracer controlled turning.

Illustrating with films, he emphasized the accuracy required to build machines incorporating tracer control.

Many manufacturers, he explained, have added tracer control to their products as an accessory. This is not conducive to repetitive production where quality control is a must and close tolerances are the rule. For these requirements tracer control must be built in as an integral part of the machine.

Ultraprecision machining, the speaker stated, is required to produce the Gagematic, Monarch's newest advance in tracer controlled turning, which operates on the same principle as an air gage. This development, in turn, puts production lathe work on a precision basis never before attainable.

Tolerances of +0.0002 in. are possible, he claimed, and +0.001 in. is easy to hold on repetitive production turning. A lively question period followed.

The meeting opened with a dinner attended by 46 members and 10 guests. A program sponsored by the Athletic Department of the University of Iowa preceded the technical session. Motion pictures were shown of 1949 U. of I. football games.

Chairman John Stark presided over a business session and John Wright, first vice-chairman, introduced the speaker.

Casting Expert Debates Investment Method Merits

Rochester, N. Y.—What are the advantages or drawbacks of investment casting? How does it compare with other casting methods in size limitations? Effects on tolerances? Physical properties of materials used?

These and other pertinent considerations in applying the "lost wax" process of casting metal were threshed out by K. J. Yonkers for some 100 members and guests of Rochester chapter attending a dinner meeting December 5 at the Barnard Exempts Club.

Mr. Yonkers, who is an application engineer in the precision casting section of the blower and condenser department at Allis-Chalmers Mfg. Co., Milwaukee, supplemented his talk with a color film explaining the process step by step from tooling, through pattern and foundry practice to finished casting.

A writer of trade paper and technical journal articles on investment casting, the speaker continued to answer questions from his listeners after the formal question period and the meeting itself had closed.

William Gordon, chapter chairman, presided over a business meeting prior to the technical session. Emmett Moore, vice-chairman, introduced Mr. Yonkers.

Left: W. R. Gordon (left), Rochester chairman, chats with K. J. Yonkers (second from right), Allis-Chalmers engineer who addressed chapter. Also in group are an unidentified guest and Norman Fowler, membership chairman. Right: Rochester members cluster around Mr. Yonkers' exhibit of precision castings.

Festive Holiday Parties Replace Technical Talks

Nashville, Tenn.—Nashville members and their women guests gathered December 16 at the Biltmore Country Club for a Christmas dinner and dance.

After dinner everyone received a Christmas gift. There was much merriment as the amusing presents were unwrapped.

Later most of the couples danced while others sat around a log fire and enjoyed chatting with old friends and making new acquaintances.

* * *

New Haven, Conn.—New Haven chapter observed the holiday season with its annual ladies night, held December 9 at the New Haven Country Club.

An informal dinner preceded an evening of entertainment. The program, presented to approximately 100 members and guests, included organ music, a barber shop quartet, technicolor motion pictures, a Santa Claus and many prizes.

Accompanied by Bud Finch as pianist, the group sang popular songs and Christmas carols.

National Director and Mrs. Victor Ericson of Worcester were among the distinguished guests.

* * *

Philadelphia, Pa. — More than 350 members and guests of Philadelphia chapter filled the Engineers Club to capacity for that chapter's Yuletide merrymaking, December 15.

Festivities began with a social hour and group singing, accompanied by an accordionist. During dinner a quartet led the singing. Extemporaneous solos were rendered by members.

Door prizes were awarded after dinner and gifts were presented to the Engineers Club employees. A program of professional entertainment and the singing of Auld Lang Syne concluded the affair.

During dinner William Chalfant, entertainment chairman, and Charles Lennig, Jr., register and reception chairman, were recognized by rousing applause for their committees' efforts in planning the party.

* * *

St. Louis, Mo.—The beautiful Capric Room at Hotel Sheraton was the settin for St. Louis chapter's annual Christmas party, December 17. Approximately 150 couples attended the function.

The evening's activity began with din ner and dancing, followed by a floo show. About midnight Old Saint Nick appeared and presented each lady wit a musical powder box. Dancing to the music of Herb Mahler's orchestra continued into the wee hours.

A rising vote of thanks was extended to the officers and to R. C. Kallemeier entertainment chairman, and his staff for arranging such an enjoyable evening.

* * *

Worcester, Mass. — On December 6 Worcester members entertained their ladies at Putnam & Thurston's.

Following dinner and remarks from Carl Schofield, chapter chairman, the meeting was turned over to Roland Ljungquist, program chairman.

After several acts of vaudeville, attendance prizes were awarded. The party continued with dancing until midnight.

Top: Wives of Worcester chapter officers are head table guests at the chapter's ladies night Christmas party. Below: The camera catches E. O. Burton, Philadelphia chapter secretary, and Erik Lund, standards co-chairman, in the midst of their chapter's holiday merrymaking.

ASTE Awardee Reads Paper Before ASME

Flint, Mich.—One of Saginaw Valley chapter's scholarship winners has captured another honor.

Charles E. Bierwirth, a General Motors Institute graduate employed in the master mechanic's department at Buick Motor Div., Flint, read a paper recently before an ASME meeting at New York City.

Mr. Bierwirth's paper, "A Study of Cutting Face Finishes and Treatments on Twist Drill Performance," is based on a project report assigned to him by Buick. This report earned him his bachelor's degree in mechanical engineering from the institute in 1948.

His paper first won public recognition in the same year, when the Saginaw Valley Tool Engineers gave him an award for the best report in the tool engineering field.

Slow Motion Pictures Reveal Machining Detail

Erie, Pa.—Forty-five members and guests of Erie chapter enjoyed dinner and a double feature home talent program in the Gannon College Room, December 6.

In the absence of Chairman Archie Weingard, First Vice-Chairman Stanley Sadoski introduced Vincent A. Peck of the Central Planning and Wage Rate Div., General Electric Co., Erie, and a past chairman of the chapter. His subject was "Practical Applications of High Speed Photography to Machining Operations."

In slow motion pictures of milling machine operations, the audience saw good and poor chip formation, high and low cutter teeth, and torsional twist in the machine spindle. Pictures of this type are expected to be helpful in explaining machine operations to workers.

Coffee speaker was W. E. McKean of the Erie Concrete & Steel Supply Co. Under the sponsorship of the Erie Rotary Club, Mr. McKean presented "Americanism," a patriotic film lecture.

U. S., Still the Best Country

The motion picture, "A Letter to a Rebel," depicted life in a small American town. Regardless of our dissatisfactions, the film pointed out, our freedom as individual American citizens is the richest thing in the world.

L. Weiner of General Electric Co., Erie, and L. A. Heish of Talon, Inc., Meadville, were introduced as new members during the meeting.

Among guests present were John Lease Reese Machine Co., Pittsburgh; J. W. Payne and J. J. Fitzgerald, General Electric Co., Bridgeport, Conn.; Angelo Cossella, Marx Co., Erie; H. E. Cherry, Thurston Mfg. Co., Providence, R. I.; G. Kinsinger and S. Zirkee, Penn Brass and Copper Co., Erie.

Ross Millikin, R. C. Neal Co.; W. Sutton, Carboloy Co.; R. Sellers, Warner-Swasey Co.; John Oge, Oge Tool Co.; Edward Dahn, American Meter Co., Inc.; all of Erie, and a group of student engineers.

McNaught Promoted

Montreal, Que.—Gordon McNaught of the Montreal ASTE chapter has been appointed sales supervisor of Harrington Tool and Die Co., Ltd.

Mr. McNaught has been associated with the Harrington sales department for a number of years, most recently as supervisor of domestic sales.

Says Human Engineering Can Avert Atomic Peril

Kansas City, Mo.—Which road are we going to take—another Hiroshima or an avenue of "human engineering" to provide beneficial uses of atomic energy for all mankind?

This pertinent question climaxed an address by O. H. Day of Butler Mfg. Co., Kansas City, before 40 members and guests of Kansas City chapter. Mr. Day spoke at the chapter's December 7 meeting at the Advertising and Sales Executives Club.

According to Mr. Day's definition, human engineering is the science of getting along together. He cited instances in all walks of life where this relationship had broken down, causing crime, insanity, child waywardness and hardships to those involved.

World, national and local problems require this human engineering approach before satisfactory solutions are found, he added.

Classifies Hard Surfacing Rods

Leonard J. Sadowski of Kirk-Wikland & Co., also of Kansas City, followed Mr. Day, discussing "Hard Surfacing and Its Merits." He described four classes of rods used for hard surfacing applications.

Class 1 rods have less than 20 percent alloy, approximately 80 percent iron and small amounts of chromium, molybdenum and carbon. They are used on heavy industrial equipment where high impact properties are required. Abrasion resistance is comparatively low.

Where high abrasion and heat resistance are required, Class 2 rods are used.

These have a composition of 20 percent or more alloy, 35 percent chromium, 4½ percent carbon and the remainder of iron. They can take medium impact loads.

Class 3 rods contain from 25 to 50 percent alloy, 1 percent carbon, 25 percent chromium, 5 to 15 percent tungsten, and a non-ferrous base. Such hard surfacing rods Rockwell from 40 to 54 on the C scale, stand medium impact loads and have low to high abrasion resistance.

For applications where extreme earth abrasion is encountered, the speaker recommended Class 4 rods. These have from 45 to 60 percent actual tungsten carbide and a hardness of 9-10 on Mohs' scale. Hard surfacing from this rod will stand high to medium impact and high abrasion. Heat of application is important to keep the carbide on the surface, he observed.

Editorial Chairmen

Early Closing Date for March

To permit early publication of the March and April show and convention issues, the March *Tool Engineer* closed January 31. *ASTE News* material received after this date will be run in the earliest possible issue.

Top: Principal figures at Evansville chapter's recent meeting at Seeger Refrigerator Co. were, from left: T. L. Pantz, works manager of the Seeger plant; M. A. Blu (technical speaker) of Sears Roebuck & Co.'s merchandise testing and development laboratories; F. A. Starkey, local Sears store manager; and H. C. McMillen, production superintendent for Seeger and a former chairman of Evansville and Dayton chapters. Below: Part of the meeting group visiting over refreshments which followed the program.

Kruse Sees Democracy Winning in Japan

Fort Wayne, Ind.—Democratic ideals predominate over communistic tendencies in Japan, according to Edward A. Kruse, Jr., Indiana congressman.

One of the greatest problems confronting that country, Representative Kruse told an audience of Fort Wayne chapter members at their December 14 meeting, is its average annual increase of one million to an already crowded population of 80 million people—confined in an area comparable to the state of California.

His recent trip to the Far East as a member of the House Appropriations Sub-Committee convinced the speaker that we should continue to lend Japan a helping hand. While in the Orient the legislator spoke with Japanese and American industrialists, labor leaders, members of the Civil Affairs Committee and others in order to study trends.

Technical speaker for the meeting was Stewart G. Fletcher, chief metallurgist of the Latrobe Electric Steel Co. His subject, "Causes and Prevention of Tool Steel Failures" was supplemented with slides.

Mr. Fletcher explained how the Reflectoscope checks material internally to find defects. Commenting on heat treating shortcomings, he anaylzed equipment and quenching media employed.

In conclusion he enumerated metallurgical factors in good tool design as: (1) avoiding sharp corners; (2) eliminating sudden changes in section; and (3) attempting to retain symmetry in design.

Research Guides Tooling For Mail Order Goods

Evansville, Ind.—Seeger Refrigerator Co. was host to Evansville chapter, December 12. Approximately 125 members and guests attended a meeting in the company recreation hall, when Marshall A. Blu of Sears, Roebuck & Co., Chicago, talked on "Case Histories of Tooling for Mail Order Merchandise."

Mr. Blu, who has charge of tool and production engineering at Sear's merchandise testing and developing laboratories, showed slides contrasting practical and impractical product designs for efficient and economical tooling. These, and his discussion of percentages of material cost, direct labor, burden and profit entering into a manufactured product highlighted the program.

Special guests at this meeting were F. A. Starkey, local Sear's store manager, T. L. Pantz, works manager of Seeger, J. A. Scarlett, superintendent of production engineering, H. J. Appel, general supervisor of tools, W. A. Holt, assistant secretary, E. A. Haynie, supervisor of budget control, and B. A. Conoway, superintendent of cabinet production.

H. C. McMillen, past chairman of Dayton and Evansville chapters and general superintendent of production at Seeger, was in charge of meeting arrangements.

Des Moines Gives Party

Des Moines, Iowa—As its first social event Des Moines chapter sponsored a Christmas party for members, friends and women guests of the three-month-old group. The function was held December 12 at De Carlo's West End Club.

Dinner was followed by dancing and entertainment until nearly midnight. Chairman John Speck welcomed the gathering which included visitors from Newton, Webster City, Cedar Rapids.

Applies Personal Ethics To Industrial Relations

Springfield, Vt.—Twin States chapter met December 12 at Trade Winds Cafe in Springfield to hear Dr. R. G. Freeman, noted Boston psychiatrist and industrial consultant on problems of personnel selection and training in industry, discuss "Human Relations and Industrial Relations."

Speaking before 50 members and guests, Dr. Freeman analyzed basic desires motivating man: happiness, opportunity to utilize his capacities to the limit, and recognition as an individual.

Using the analogy of fundamental truths contributing to the well regulated, happy family, he drew parallels applying to the operations of any organization from a combat ship to an industrial plant. A question and answer period followed Dr. Freeman's lecture.

Chairman Lee Davis presided at the meeting and Vice-Chairman H. H. Ranney introduced the speaker. Guests at this meeting were C. L. Gobidas of Cleveland, Carl Pratt of Chicago, W. K. Facknitz of Detroit, and Messrs. Marrenneau, DesMontes, Brunaud, and Corbeau of Paris, France.

Inspection Instruments Displayed at Detroit

Detroit, Mich.—Marvin W. Davis & Associates, manufacturers agents with offices in the ASTE headquarters building at 10700 Puritan Avenue, are showing two new devices for inspecting metal parts.

Throughout the month of February the firm will display and demonstrate Eastman Kodak Co.'s Conju-Gage for composite checking of spur and helical gears and their Contour Projector for comparing, by optical magnification, parts made in difficult shapes or of easily distorted materials.

Models of the instruments, which are just going into production, constituted one of the outstanding exhibits at the 1948 ASTE Exposition.

Mr. Davis, himself a Detroit chapter member, will welcome local or visiting members of the Society.

Saginaw Valley Makes Telephone Plant Tour

Flint, Mich.—Saginaw Valley tool engineers learned what happens in the intricate electric nerve system behind a telephone dial, when representatives of the Bell Telephone Co. escorted 85 ASTE members and guests through the local plant, November 17.

At the long distance switchboards, the engineers watched operators relay toll calls and give information.

One floor has long, ceiling-high racks carrying relays for the dial system. Another is devoted to long distance lines and equipment. By means of trouble shooting devices, service men can locate breaks in these lines without leaving the building.

The ASTE group met for dinner at Masonic Temple before making the trip.

More Than 600 Crowd Television Talk and Plant Tour

Chicago, Ill.—One of the largest groups ever attending a Chicago chapter meeting turned out December 13 when more than 600 members and guests learned the physics of video and toured the television set factory of Motorola Corp.

A technical program at Harmony Hall preceded the tour. Anton Schwister, chapter chairman, introduced Walter B. Scott, Motorola works manager, who discussed management aspects of the firm and operations to be viewed in the plant.

"Television in Everyday Language" was presented by Charles Blahna, engineer in charge of quality control television production.

Using an oscilloscope, Mr. Blahna showed the development of a television picture. A beam of electrons from a heated cathode, impinging on a phosphor screen, produces a pinpoint of light which oscillates horizontally to produce a line. When the beam is moved vertically a pattern of lines is formed.

By speeding up the beam a solid square of light is projected. In a television receiver the intensity of the beam is varied to control the brightness of the screen and to produce an image.

Scans 30 Pictures Per Second

To make the 525 horizontal lines composing a television picture, the electronic beam scans 262½ lines, then retraces and weaves lines between. In this interlacing 60 half pictures or 30 complete pictures per second are flashed. The beam sweeps across the tube in 1/15750 second, flies back in 7 microseconds.

Mr. Blahma described the operation of a trap developed to eliminate ion spots which limited early cathode tubes to about 100 hours of operation. The magnetic system used to deflect the electronic beam also was discussed.

Following the presentation by the two authorities, the party was conducted through the Motorola television plant to see operations described by Mr. Scott.

Starting at the receiving department, material is checked and passed along to incoming inspection and to the stock department for storage and distribution.

Using complex machines girls in the coil winding department wind fine wire in a precise pattern.

Small parts requiring special machinery and those made on a production basis are assembled in the preliminaries department. In the press room, sockets and terminals are attached by heavy riveting machines.

Parts assembled by the press room, preliminaries and coil winding departments are gathered together near the press room and sent to one of the 11 progressive assembly lines. Operators on these lines perform the bulk of the work, including wiring, soldering, inspection, electrical alignment, assembly into the cabinet, final checking and packing.

About 12 per cent of these workers are inspectors who are responsible for the correctness of a set before it is tested.

After following the television assembly on the production line, the engineers were given demonstrations of Walkie-Talkie sets and of ultrashort-wave transmission of telephone messages.

John Beck, chapter standards chairman, was responsible for arranging the highly educational meeting.

Left: Anton B. Schwister (center), Chicago chapter chairman, introduces Walter B. Scott and Charles Blahna of Motorola Corp. to an overflow audience (right) of more than 600 members and guests eager to hear television explained in lay terms.

Variable Speed Motor Is Mechanical Brain

San Diego, Calif.—A multitude of demonstrations in which variable speed electric motors helped increase machine production and cut operating costs moved across a motion picture screen before the eyes of San Diego members during a chapter meeting held lately at Imig Manor Hotel.

The color film, "Rhapsody in Speed," highlighted an instructive lecture presented by Norman D. Ferguson, vice-president of California Electric Works, San Diego, in conjunction with U.S. Electrical Motors, Inc., Los Angeles.

Impressive savings in time, the pictures showed can be effected by using Varidrive motors. They can regulate speed of machinery to compensate for changes in viscosity, temperature, humidity or quantity while material is being processed and to control time for drying, heating, baking, cooking, and chemical action.

Responding to thickness and hardness of material and condition of equipment, these motors alter the rate of feed of material to cutters and grinders. In other applications they match speeds of machines which must operate together and reduce setup time when changing machines to handle different sizes of work.

Fond du Lac Visits Grain Drill Plant

Fond du Lac, Wis.—The John Deere-Van Brunt plant at Horicon entertained Fond du Lac chapter December 9.

After dinner the group made a two-hour tour of the factory to watch the assembly of a grain drill.

Although some members drove more than 130 miles through a snowstorm to attend the meeting, they felt rewarded by the well-planned tour and the company's hospitality.

Obituary

Harry J. Merrick

Harry J. Merrick, executive secretary of the Cutting Tool Manufacturers Association, Detroit, died suddenly, December 12, at his home in Grosse Pointe, Mich.

Born in Scranton, Pa., in 1903, Mr. Merrick received his B.A. from the University of Michigan and a B.L. from Fordham University.

Upon graduation in 1930 he began a general legal practice in Detroit, also serving as public administrator for Wayne County from 1935 to 1937. He was appointed to the National War Labor Board, Region 11, in 1943, as public panel member and arbitrator.

In 1944 he left the War Labor Board to become executive secretary of the CTMA when that organization was formed. After affiliating with the tool industry, Mr. Merrick became a member of the Detroit chapter of ASTE.

Credits Casting Process To Dental Profession

Hamilton, Ont.—Industry is indebted to the dental profession for the perfection of a modern metalworking process, C. R. Whittemore informed Hamilton chapter members. Mr. Whittemore, chief metallurgist of Deloro Smelting & Refining Co., Ltd., was guest speaker at the chapter's December 9 dinner meeting at the Brant Hotel, Brantford. He was introduced by Samuel Davis.

In its early and inaccurate stages, the speaker explained, dentists and later jewelers used the "lost wax" method of precision casting. He then went on to describe how the dental trade finally perfected this method to give finish and detail to intricate castings.

With lantern slides, Mr. Whittemore showed examples of high temperature alloy investment castings held to extreme accuracy, such as complex jet engine parts. This method, he added, is also used wherever close tolerances are required without machining.

C. R. Whittemore of Deloro Smelting & Refining Co., Ltd., holds close attention of Hamilton members as he relates how the dental profession developed precision casting, now widely adopted by industry.

During a business meeting preceding the technical session Chairman George Gilmour commented on the progress of the chapter educational courses at Hamilton and Brantford. He also presented a Society pin to Max Samuely, a new member.

Past Chairman Gordon Hall, a member of the Program Committee, announced the formation of the Knotty Problem Committee. Members are invited to submit their mechanical problems to Mr. Hall or to any member of his committee. Answers will be given during monthly meetings.

Stanard Retires

Flint, Mich.—Charles H. Stanard, for the past six years productive gear engineer of Buick Motor Div., General Motors Corp., Flint, has retired and will continue to live here.

A member of the Saginaw Valley chapter of ASTE, Mr. Stanard is secretary of Technical Committee 13 on Involute Splines and Serrations of the ASA Sectional Committee B5, Small Tools and Machine Tool Elements.

Coming Meetings

ALL CHAPTERS—February. Election of chapter officers, delegates and alternates. March. Installation of officers.

CENTRAL PENNSYLVANIA—February 16. Speaker: B. O. Hultgren, The Bellows Co. Subject: "Production Miracles Through Controlled Air Power." March 16. Speaker: C. A. Siebert, consulting metallurgical engineer. Subject: "Metallurgical Factors Related to Tool Design."

CHICAGO—February 14, 8:00 p.m., Western Society of Engineers. Speaker: H. L. Stewart, Logansport Machine Co. Subject: "Fluid Power in Action." March 14, Chicago Furniture Club, Annual Ladies Night. Dinner and program to be announced. Officer installation by Director Roger Waindle of Fox River Valley chapter.

CLEVELAND—February 22. Plant tour, Cuyahoga Works, American Steel & Wire Co. March 10, Cleveland Engineering Society, joint meeting with Society of Automotive Engineers. Speaker: E. V. Crane, chief engineer, H.P.M. Subject: "Plastic Flow of Metals as It Governs Metal Work Operation in Presses."

DES MOINES—February 15, 7:00 p.m., Hotel Kirkwood. Speaker: Dr. H. B. Osborn, Jr., technical director, Ohio Crankshaft Co., Cleveland, Ohio. Subject: "Induction Hardening."

ELMIRA—March 6, 7:00 p.m., Mark Twain Hotel. Speaker: P. E. McKeith, U. S. Tool Co., Ampere, N. J. Subject: "U. S. Multi-Slide."

ERIE—March 13, 6:30 p.m., Gannon College Commons Room. Speaker: R. G. Lorraine, General Electric Co., Schenectady, N. Y. Subject: "Atomic Energy in Layman's English."

FAIRFIELD COUNTY—March 1. Tentative: Speaker from The Bakelite Corp. Subject: Modern Approach to Plastics."

LITTLE RHODY—March 2, 7:00 p.m., Oates' Tavern, North Providence. Speaker: Ralph E. Rawling, president and treasurer, Rawling Gear Works, Worcester, Mass. Subject: "Gear Cutting."

NEW HAVEN—March 9, 6:15 p.m., dinner, Fitzgerald's Restaurant. Technical session, 8:00 p.m. Speaker: K. N. Macomber, Lapointe Machine Tool Co. Subject: "Broaching."

PHILADELPHIA—February 16. Speaker: William DeBoer, Engineers Specialties Div., Buffalo, N.Y. Subject: "Optical Projection—Inspection and Assembly." March 16. Yale & Towne Night. April 10-14, Convention Hall and Commercial Museum, Tool Engineer's Exposition and 18th ASTE Annual Meeting. April 13. House of Delegates and Board of Directors meetings.

TORONTO—March 1, 6:45 p.m., Oak Room, Union Station. Speaker from Upton Bradeen and James, Ltd. Subject: "Resistance Welding." March 24. Annual Dance, Royal York Hotel.

TWIN STATES—March 9, Springfield, Vt.

THE TOOL ENGINEER'S *Service Bureau*

FREE BOOKLETS AND CATALOGS CURRENTLY OFFERED BY MANUFACTURERS

Abrasive Segments

Bulletin Form No. ESA-188 explains how segments are used, and their advantages, and discusses abrasives and bonds employed; gives grain and grade recommendations for both surface grinding and machine knife grinding operations. *Simonds Abrasive Co.*, Tacony and Fraley Sts., Philadelphia 37.

Boring Tools

Eight-page folder includes price lists on single point solid rod boring tools in addition to references charts for boring tool applications such as micro-inch chart and surface speed chart for precision turning and boring. *Industrial Carbide Tool Co.*, 33 Hermon St., Worcester 8, Mass.

Bushings

"Single-flip" quick-reference catalog No. B-649 presents dimensions and information on standard drilljig bushings or liners, plus information on how to order standard and special bushings; material specifications; grinding stock allowed in addition to table of drill sizes and decimal equivalents. *Colonial Bushings, Inc.*, P. O. Box 37, Harper Station, Detroit 13.

Case Hardening

Folder describes application of dry (gas) cyaniding process to operation of continuous and batch-type industrial furnaces to caseharden steel in atmosphere containing a carburizing gas with ammonia added in controlled amounts. Advertising Department, *Surface Combustion Corp.*, Toledo 1.

Chucks and Segments

Light-weight, simple and easily-handled chucks and segments for surface grinding described in illustrated folder by *The Sterling Grinding Wheel Div.* of the Cleveland Quarries Co., Tiffin, Ohio. Price list included.

Drilling and Tapping Units

Illustrated brochure contains detailed data on automatic drilling and tapping units incorporating centrifugal feeding action with full hydraulic control; line drawings point out special equipment, electrical controls, specifications and adaptations. *Govro-Nelson Co.*, 1931 Antoinette, Detroit 8.

Drills and Reamers

Forty-eight page catalog on line of high speed twist drills and reamers includes price and specification lists for standard sizes and types of taper and straight shank regular, three-fluted drills as well as hand and machine chucking reamers, in addition to other popular and special-purpose drills and reamers. *Charles H. Besly & Co.*, 118 N. Clinton St., Chicago 6.

Fasteners

"Handbook on Fastening Specialties" features descriptive and engineering data on company's line of blind rivets, anchor nuts, panel fasteners, door-retaining springs recently developed items. Gives illustrated uses plus specification tables and diagrammatic drawings to show installation. *South Chester Corp.*, Finance Bldg., Philadelphia 2.

Gear Shaving, Rotary

Illustrated brochure gives basic principles of rotary shaving, elements of machine operation, cutter characteristics and action, crossed axes principle and relation between cutting and guiding action plus recent developments in the work, discussion of diagonal shaving and other pertinent information. *National Broach and Machine Co.*, 5600 St. Jean, Detroit 13, Mich.

Grinder, Hydraulic

Bulletin illustrates and describes construction features and types of jobs performed by recently introduced 1024 universal hydraulic grinder of *Rivett Lathe & Grinder, Inc.*, Brighton 35 (Boston), Mass. Includes general and parts specifications.

Heavy-duty Presses

Illustrated booklet gives detailed information and specifications on line of Danly heavy-duty autofeed presses, available from 50 to 800 tons for high production stamping operations. *Danly Machine Specialties, Inc.*, 2100 S. 52nd Ave., Cicero 50, Ill.

Power Shears

Bulletin No. 71-I describes and pictures line of power shears for light gage sheet metal; includes specification tables. *Niagara Machine & Tool Works*, 637-697 Northland Ave., Buffalo 11, N.Y.

Presses

Bulletin 749 presents general specifications, basic press construction and design details of standardized line of hydraulic metal forming presses available in 100, 150 and 200 ton capacities with or without hydropneumatic cushion for deep metal drawing. *Lake Erie Engineering Corp.*, Buffalo 17.

Presses, Power

Bulletin 211 pictures line of open-back inclinable presses from 30 to 75 ton capacity; cut-away drawings show important design features including Clearing swing key clutch and clearing pneumatic friction clutch; engineering specification drawings with tables. *Clearing Machine Corp.*, 6499 W. 65th St., Chicago 38.

Rust Preventative

"New All-Star Line-Up of Rust Preventatives" describes and lists uses for company's eleven Rust Veto products; full page chart gives physical properties of each plus data as to thickness, type of film, amount of coverage obtained, etc.; illustrated. *E. F. Houghton & Co.*, 303 W. Lehigh Ave., Philadelphia 33.

Valves

Illustrated four-page Folder-A describes line of valves for air control needs in addition to solenoid valves for air, water and oil service; cross section drawings picture air flow through valves indicating open, closed and exhaust positions. *Valvair Corp.*, Akron, Ohio.

Valves

Illustrated 8-page bulletin No. 302 describes in-line master valves which permit faster machine speeds with easier operation. *Ross Operating Valve Co.*, 120 E. Golden Gate Ave., Detroit 3.

Vibration Control

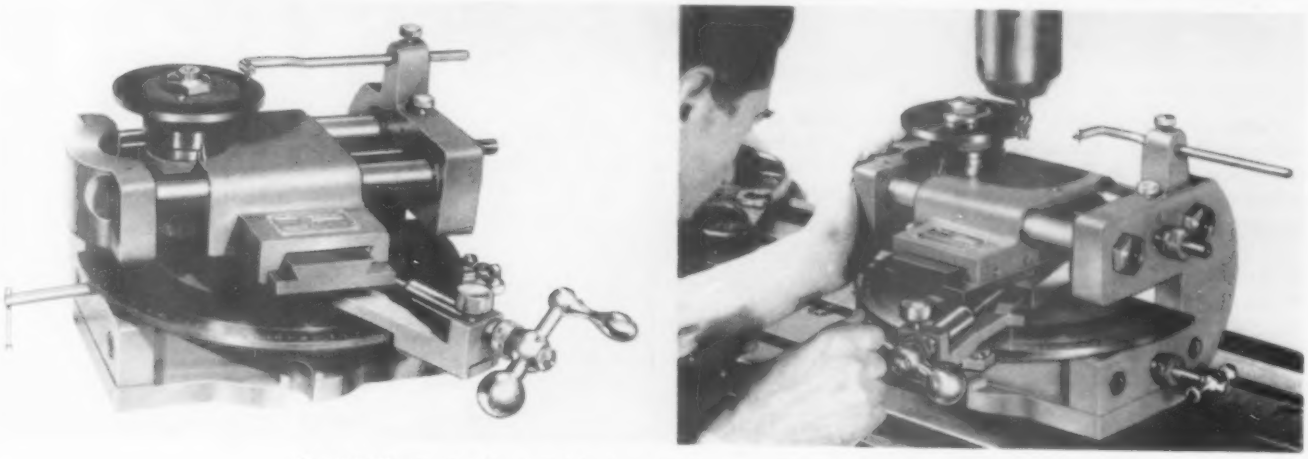
Bulletin LK551 illustrates typical equipment installations requiring vibration, shock and noise isolation. Describes six sizes of isolation mountings utilizing steel springs as medium with resilient snubbers. *Korfund Co.*, 48-40J—Thirty-Second Place, Long Island City 1, N. Y.

Welding, Resistance

"Design for Resistance Welding" illustrates and explains advanced techniques in resistance welding processes; covers theory and application of spot, seam, projection and butt welding, and also includes 11 tables for guidance of resistance welding users. *The Resistance Welding Institute*, Hartman Bldg., Detroit Ave. at Warren Rd., Cleveland 7.

TOOLS OF TODAY

Helix Master Cam Miller by Sheffer Collet Company



The Helix-Master Cam Miller, at left above, is shown set up for operation at right.

Announced by Sheffer Collet Company, Traverse City, Mich., is the Helix Master, a self-contained cam milling machine—actually an attachment—built for mounting on a vertical milling machine, grinder or even a drill press having a normally rigid spindle construction. Designed to obviate the high and low spots ordinarily incidental to the milling of cam lobes, and to produce cam contours on which the rise of any lobe is perfectly consistent throughout its entire length, the Helix Master is said to introduce two important improvements in cam milling:

1. Through the geometric action of three compounded slides, it assures lobes with a consistent rise through every 1/100 of segment; no fast or slow intervals. The surface profile is generated in one continuous sweeping motion.

2. It will produce a perfect cam directly from engineering computations without any drawings, templates or preliminary layout. A blank stamped in hundredths is equally unnecessary inasmuch as these calibrations are embodied in the machine itself.

As the attachment is not geared, linked or synchronized to any machine tool upon which it may be mounted—and it may be mounted the same as any vise or fixture—it provides the advantage that no one machine tool need be confined to the single purpose of cam milling. Its inherent accuracy is due to a system of three triangularly arranged slides.

Two of these slides form a fixed right angle while the third is infinitely variable through 180 degrees—that is, 90 deg either left or right. The top slide, which serves as the spindle carrier, moves radially to form the base of the triangle. This equals the rise of the lobe to be cut.

The vertical side of this triangle is formed by a cross slide dovetailed at a fixed right angle to the spindle carrier. This slide has a rack cut along one edge which engages the spindle drive gear on a 1: 1 ratio. Any linear motion transmitted to this slide rotates the spindle, which is calibrated into 1/100ths of its circumference, an equal amount.

The third slide, which forms the hypothenuse of the triangle, is the key to the entire mechanism. Consisting of a double quadrant, or semi-circular scale with an arm pivoted at its center, this scale is calibrated for direct reading of 0.001 in. rise in 1/100 of spindle circumference. Thus, zero or dead center describes a perfect circle, while right or left of center gives positive or negative readings.

The arm, which may be swung throughout this 180 degree arc, is dovetailed its entire length and is traversed by a shorter slide driven by a hardened and ground Acme lead screw. In turn, this driven slide is pivoted to the rack—or cross slide—mentioned in the preceding paragraph. Thus, all moving members of the Helix-Master are positively engaged with each other by a series of dovetails and fulcrums, so that a movement of any one of these parts sets up a series of complementary motions in all other parts of the complex.

To summarize: By adjusting the angular setting of the selector slide and turning the lead screw, the driven slide describes the hypothenuse of the triangle. In turn, this drives the other two slides a distance in direct ratio to the triangular proportions, causing the spindle to be rotated by the cross slide at the same time it is being traversed radially by the carrier slide. Thus, it describes a perfect helix.

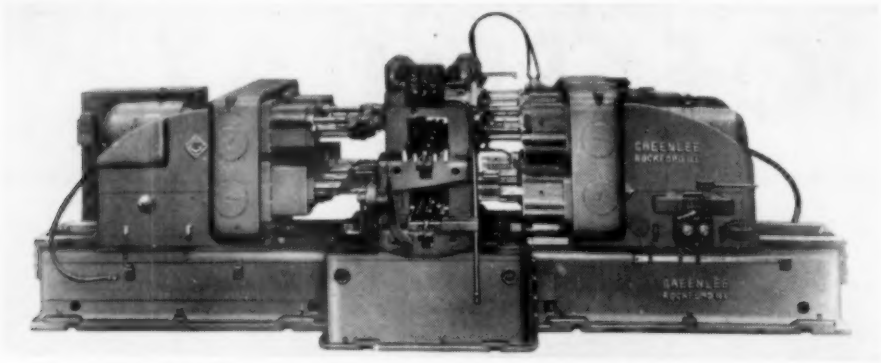
In laying out a cam, all that is necessary is to place the blank on the spindle with the spindle dial set at zero. If the first lobe is to have a rise of 0.010 in. per 1/100 section for 12/100's, set the selector arm at 10, space off 12 divisions on the spindle dial, lock in position and start to feed by turning the lead screw. After the first lobe is completed, progress the spindle to the correct setting for the second lobe and proceed as before.

The foregoing description should give the reader a fairly clear insight into the operation of the attachment. While the maker states that it is possible to mill a cam directly out of the solid blank with this attachment, the process is not recommended. Since the blank can only be supported at its center, with consequent overhang, a certain amount of vibration is unavoidable under heavy roughing cuts.

For this reason, a scribing setup is incorporated whereby the cam layout can be drawn directly on the blank and excess metal removed by any available means prior to finish milling or grinding. This procedure, which is also common to conventional methods of cam production, will usually prove the more advantageous. **T-2-1**

See Page 64
for Handy Tools of Today
Coupon

Two-Deck 6-Station Transfer Machine Performs 60 Operations



Using a double-deck system, a 6 station Transfer Machine, built by Greenlee Bros. & Co., Rockford, Ill., performs sixty drilling, reaming, and tapping operations on the sides and ends of cylinder and valve housings. The part is first loaded into the lower deck, where 50 drilling, reaming, and tapping operations are performed. It is then turned ninety degrees and placed in the upper deck, where the remaining 10 drilling and reaming operations are completed.

To hold the close tolerances required during the machining operations, the parts are located in both decks by dowel pins and firmly held in pneumatically-powered wedge clamps. The work pieces are transferred manually from one station to another through a continuous chain system. A locking device makes double-indexing impossible until the cluster-type heads have completed the machining cycle. **T-2-2**

Hot-Work Tool Steel

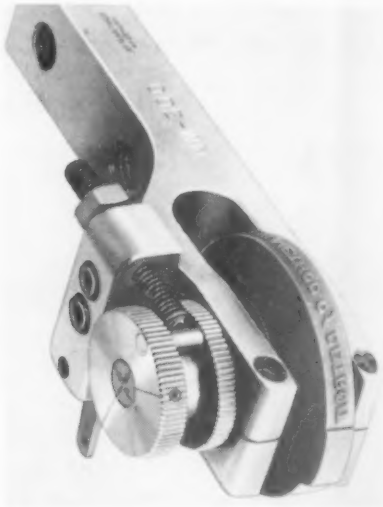
Allegheny Ludlum Steel Corporation, Pittsburgh 22, Pa., announces a tool steel specifically designed for hot work. Marketed under the name B-47 Hot Work Steel, the alloy is a combination of chromium, tungsten, cobalt, vanadium and iron which, in extensive laboratory and field tests, has shown excellent resistance to shock and abrasion at elevated temperatures.

Although its good hot hardness is said to permit the alloy to do any number of severe hot work jobs without washing out or changing size, it is specifically recommended for applications which require good toughness at relatively high hardness, or where abrasion resistance and resistance to heat checking are important factors.

The maker recommends the product for such applications as brass extrusion dummy blocks and dies, valve extrusion and forging die inserts, forging press dies and hot punch tools. **T-2-3**

Automatic Roll Marker

Announced by New Method Steel Stamps, Inc., 147 Jos. Campau, Detroit 7, Mich., is an Automatic Roll Marker for die marking of screw machine products during the machine cycle.



Suitable for both light and heavy work on automatic and hand operated screw machines, turret lathes or other turning machines, the tool advances, marks the part and clears it like other tools in the setup. The marker thus eliminates the need for separate setups and operations for marking.

The tool marks only once—no "double impressions" and automatically resets for next part. Dies are readily interchanged, and the tool as a whole is designed for continuous service on long production runs. **T-2-4**

Use This Coupon for Complete Information On Tools of Today Items Featured This Month

For your convenience, a key number follows the announcement of each product reviewed in the *Tools of Today* section of THE TOOL ENGINEER. To obtain complete information on any of these products, circle the corresponding key numbers on this coupon, and mail the coupon to THE TOOL ENGINEER.

Tools of Today Department, THE TOOL ENGINEER
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T-2-1	T-2-2	T-2-3	T-2-4	T-2-5	T-2-6	T-2-7	T-2-8	T-2-9
T-2-10	T-2-11	T-2-12	T-2-13	T-2-14	T-2-15	T-2-16	T-2-17	T-2-18
T-2-19	T-2-20	T-2-21	T-2-22	T-2-23	T-2-24	T-2-25	T-2-26	T-2-27
T-2-28	T-2-29	T-2-30	T-2-31	T-2-32	T-2-33	T-2-34	T-2-35	T-2-36
T-2-37	T-2-38	T-2-39						

Name .....

Position .....

Firm .....

Street ..... City, State.....

Reflectoscope by Sperry

Functional changes and modifications which facilitate interpretation of test results are features of the Type UR, Style 50E50 portable ultrasonic instrument for testing metals, announced by Sperry Products, Inc., Danbury, Conn. The instrument replaces the company's previous Type SR05.

Fundamentally, the Reflectoscope consists of a pulse-generator used to generate short pulses of electrical energy; a crystal "searching unit" used to convert the electrical energy into ultrasonic energy, and to couple this to the material under test. The searching unit also converts reflected ultrasonic energy into electrical energy and returns it to an amplifier, which increases the amplitude of the pulse sufficiently to cause an indication on a cathode-ray tube. A "sweep generator" is included to provide a time base for the cathode-ray tube and a "marker generator" produces a square-wave trace to furnish a measurement of distance.

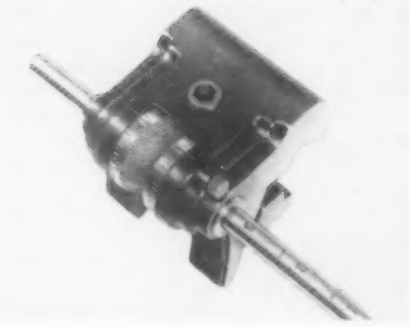
The Reflectoscope is used to test steel billets, forgings, castings, finished stock, and a wide variety of machined parts. Welds are tested by means of the angle-beam technique, in which ultrasonic vibrations enter and leave the tested material at an acute angle to the surface, and travel through the material by successive reflections between the surfaces. **T-2-5**

For Cutting Oil Economy

A saving of 50 percent in cutting oils of water soluble type is claimed for "501 Oilsaver", a product of the Beacon Rust Proofing Mfg. Co., 20 E. 33rd St., New York 16, N.Y. A small quantity—1 part to 400 parts of water—is said to allow a 50 percent reduction in oil with no loss in coolant standards.

Anti-rust protection of machines and machined parts is also a feature of this compound, which leaves an invisible protective film on the surface it contacts. The manufacturer will send a free test kit if requested on company letterhead; however, it is suggested that requests should be accompanied by a description of machining operation, metal worked, cutting oil, and a dilution formula. **T-2-6**

Combination Micrometer Stop



Announced by Ellwood Products Co., 3049 E. Grand Blvd., Detroit 11, Mich., is the combined Harper Lathe Carriage Spacer and Micrometer Stop. Built to fit all lathes, this attachment is adjustable by 0.001 in. from zero to 6 in. and serves all purposes for which it is designed. The micrometer roller, which has hardened and ground threads, is graduated on both ends and numbers run in opposite directions to eliminate subtractions when making settings either way. **T-2-7**

Continuous Oil Groover

The Wicaco Continuous Oil Groover, by the Wicaco Machine Corp., 4802 Stenton Ave., Philadelphia 44, Pa., is designed for fast, accurate grooving on bearings of practically any type and size with its capacity. Grooves can be cut in holes ¼ to 4½ in. in diameter, and work with an O.D. of 4½ in. can be held in the standard 3-jaw chuck, with larger or irregularly shaped workpieces held on the standard face plate. Maximum depth of groover is $\frac{7}{32}$ in.; maximum width, ⅜ in.

Spindle stroke is adjustable by increments of $\frac{1}{16}$ or ⅛, the latter standard, with capacity 0 to 7 in. Grooves of any lead, right or left-hand, X or multiple can be cut; in addition, half bearings may be grooved and workpieces may further be slotted or machined with elliptical holes. Fully described in a comprehensive bulletin. **T-2-8**

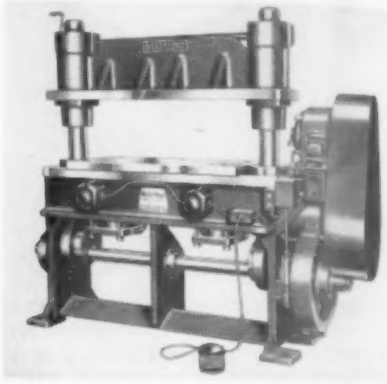
Electronic Sound Probe

A Sound Probe, utilizing the principles of electronics, is announced by the Como-Tex Company, 128 W. Lake Street, Chicago 1, Ill. The device localizes sound electronically, bringing it to a focal point. It may thus be accurately traced to its source.

The probe brings out a natural reproduction of noise at the source, but greatly amplified and without distortion. That is, a particular noise in a motor or bearing may not only be heard but identified because all foreign or built-up sounds are absent. The sound probe is said to be so sensitive that the tick of the finest watch is clear and distinct. Literature on request. **T-2-9**

Double Crank Punch Press

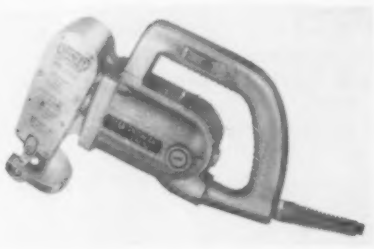
Added to its line of double-crank large bolster area punch presses, by the Diamond Machine Tool Co., 3429 E. Olympic Blvd., Los Angeles 23, Calif., is the Model 3036 Multi-Max Punch Press which, as claimed by the maker, has the particular advantage over other double crank presses in that it is rated at only 30 tons capacity yet combines a large bolster area of 16 x 36 inches and a ram area of 10 x 36 inches. Because of the large bolster area, combined with the speed of the press—80 strokes per minute—a wide variety of metal stamping operations are made possible economically.



The press embodies two 8 in. pneumatic draw die cushions and an electrically operated solenoid clutch mechanism with hand operated dual push button safety switches and remote control foot switch. The press is of all-steel weld construction with a 4-point engaging clutch. Standard stroke is 2 in.; maximum stroke to order 4 in.; and ram adjustment is 2 in. Standard shut die height is 10 in.; with maximum to order 24 in. The press is single geared with precision herringbone gear design. Crankshaft is 3 in. in diameter and is heat treated, ground, and highly polished. Motor required is 3 hp, 18 rpm. **T-2-10**

Unishear by Stanley

Stanley Electric Tools, New Britain, Conn., announces Unishear No. 214A, a light-weight, streamlined protable electric shear that cuts up to 14 gauge hot rolled steel at a speed of 15 to 20 fpm.



A simple, improved blade motion "feeds in" the work so that little effort is required by the operator in cutting straight lines, curves, angles and notches with hair line accuracy. Improved method of blade adjustment permits easy and quick setting of blades.

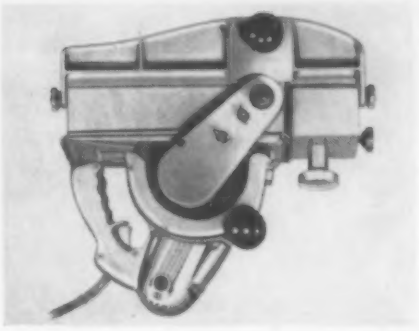
Yoke is made of special heat treated alloy steel, with a minimum number of moving parts. A universal ball and roller bearing motor operates on either DC or AC, 60 cycles or less; voltages 115, 220, 230 or 250. Minimum radius of ½ in. left hand and 1¼ in. right hand. Net weight 9½ lbs. **T-2-11**

Carbide Thread Plug Gages

Size Control Company, a division of American Gage & Machine Co., 2500 W. Washington Blvd., Chicago 12, Ill., offers reversible Carbide Thread Plug Gages in all sizes from No. 5-40 in NC, NF, NEF, and special sizes.

Since the hardness of the material used greatly extends useful life with reduces inspection costs, the gages permit passage of piece parts which might normally be rejected. Fully described in Catalog 49. **T-2-12**

Combination Power Tools



A 4 in. plane that is quickly convertible into a 6 in. portable saw (illustrated) has been added to the Cummins line of portable tools. This tool is said to do a fast, easy and accurate job of surface, door or bevel planing. Planes with or across the grain to leave a smooth, chatter-free finish.

Also by Cummins is Model 600 6 in. Portable Saw which, designed as a general purpose tool, and the Model 650 Sander Saw, a 4 in. belt sander quickly convertible to a 6 in. portable saw. Further information may be had from Cummins Portable Tools, 4740 Ravenswood Ave., Chicago 40, Ill. **T-2-13**

Enclosed One-Point Press

Announced by E. W. Bliss Co., Toledo 7, Ohio, are One-Point Presses of 500 tons capacity and larger. These presses which require less headroom, feature a box type crown, long, fully endorsed slide, barrel type slide adjustment and Meehanite castings throughout.

Headroom is lowered because the main drive unit is lower and the clutch and flywheel assemblies are outside the crown. The latter a long, deep box-like structure, extends below the main gears to give rigid connections between the front and rear members. Front and rear crown panels are individual box sections.

The slide, which is completely guided by long gibbing, has a power elevating unit consisting of a worm driven barrel type connection. Bolster and slide are the same area from right to left.

The main drive, fully eccentric, has a twin drive for balanced loading. The main shaft rotates in the crown bearings and does not carry torsional load.

Bolster and slide dimensions, location and size of T-slot holes, pressure pin holes and other construction features are all to the J.I.C. standards. T-2-14

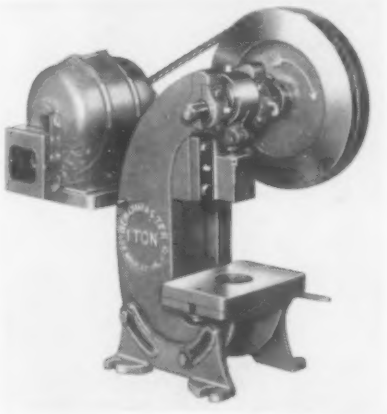
Automatic Oil Lubricator

An Automatic Oil Lubricator for slat conveyors, that provides positive timing, is announced by the J. N. Fauver Co., Inc., 49 W. Hancock, Detroit 1, Mich. Cycle of operation: tripping mechanism actuates a micro switch which, in turn, energizes a timer that controls the operation of a straight-away solenoid valve.

The valve opens when the tripping mechanism is actuated by the wheels on the outside of the slat conveyor, and remains open until closed by the timer. The timer setting thus allows a predetermined measured amount of oiled air to be injected into the wheel bearings. Timers are required on installations where the speed of the conveyor is slow—in this case only three feet per hour. T-2-15

Improved Benchmaster

Benchmaster Mfg. Company, 2952 West Pico Blvd., Los Angeles 6, Calif., announces, among improvements on their recently introduced 1-ton "plus" Midget Press, a motor with a belt tension stop that takes the weight load of both motor and bracket off the Vee belt. With reduced belt tension, life is increased on motor and flywheel bearings.

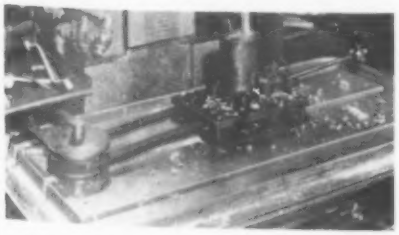


The entire motor mount assembly has also been relocated, lowering center of gravity of the press. The frame has been generally strengthened and further streamlined, clutch mechanism and linkage have been improved and easier lubrication is afforded by addition of pressure lubrication fittings at all wear points.

The bed has been altered by incorporation of two hold-down slots by which the bolster plate is fastened, which now permits use of standard dies; also more open height results. **T-2-16**

Eliminates Torque Hazard

While originally designed as a safety holder for production drilling and tapping operations, for which it is finding broadening applications, the Torkarm is also favored among home workshop hobbyists because of safety features.

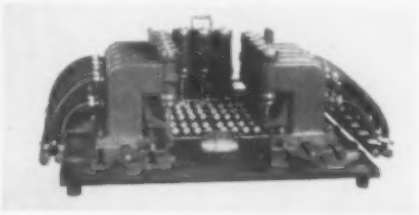


Operating on the principle of a pantograph machine, the device holds work securely on the drill press table yet permits free movement across the work table. Thus, it eliminates at once the hazard of holding parts by hand and the recurrent clamping and setup which would be required were the part to be clamped down for each hole drilled or tapped. Full information from Torkarm Company, 2908 So. Emerson Ave., Minneapolis 8, Minn. or 21306 John R. Rd., Hazel Park, Mich. **T-2-17**

Multiple Head Riveters

Special multiple-head Pneumatic Riveting Machines, added to the Hill line of riveters, are made to suit the job and utilize standard heads which may be spaced as close as 2¾ in. centers.

Air supply is handled through a single solenoid-operated air valve controlled by a foot switch in conjunction with an adjustable timer which limits the time of the riveting cycle. A pressure reducing valve is also provided. By adjusting the air pressure and the riveting time, the desired peening effect can be closely controlled.



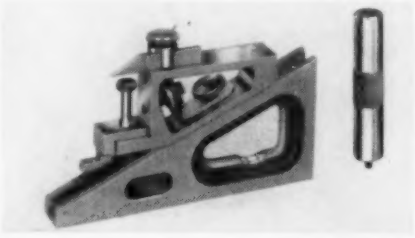
Illustrated is a 13 head machine for assembling an electric stove heating element frame, in which each head is provided with a pneumatic clamp to hold the part in the locating fixture. The position of the heads can be adjusted to accommodate various sizes of frames. Further information from the Hill Machine Company, Dept. TE, 1041 W. State St., Rockford, Ill. **T-2-18**

Universal Precision Gage

Specifically designed for gage makers, inspectors, tool and die makers, and machinists, the Starrett Universal Precision Gage combines the features of fine adjustment and all-around versatility necessary for more accurate and faster settings on a wide variety of applications.

A quick adjustment of the knurled thumb screw sets the gage smoothly and precisely to the exact size required, either from a micrometer, height gage, vernier caliper or gage blocks. A clamp nut locks the slide securely in place. Both thumb screw and lock nut are smaller than the gage thickness; this, together with flush surfaces, permits base, end, and top of slide to be used on all sides without interference.

Other features that make the gage truly universal is a scribing attachment which can be used as a surface or height gage. A novel offset attachment or "foot" is also available that permits settings in narrow areas or for working ⅛ in. below the base line. The 2 in. knurled extension provides an increased range of 9¼ in. An inbuilt level in the base is another desirable feature.

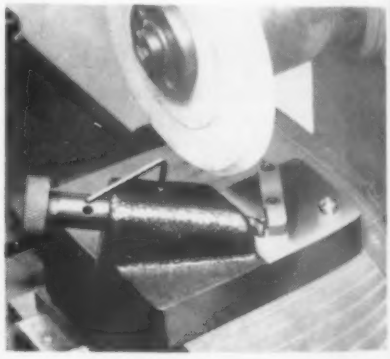


Among useful applications, the tool may be used as a planer and shaper gage; for gap measurement, face to face; as an adjustable parallel; for transferring settings with indicators on surface plates or machine platens for checking and layout; as a height gage; as a scriber for setting up and leveling with gage blocks or a sine bar.

All working surfaces are hardened and accurately ground to close limits for parallelism and alignment. An exclusive feature is the combination flat and "V" ways, on the slide and base, which are form ground to provide superior line contact insuring accuracy in all positions without side play. Approximate width of the gage is ¾ in; length 5¼ in. Capacity, with both extensions, 10¼ in., without extensions, 7 in. T-2-19

Boring Tool Sharpener

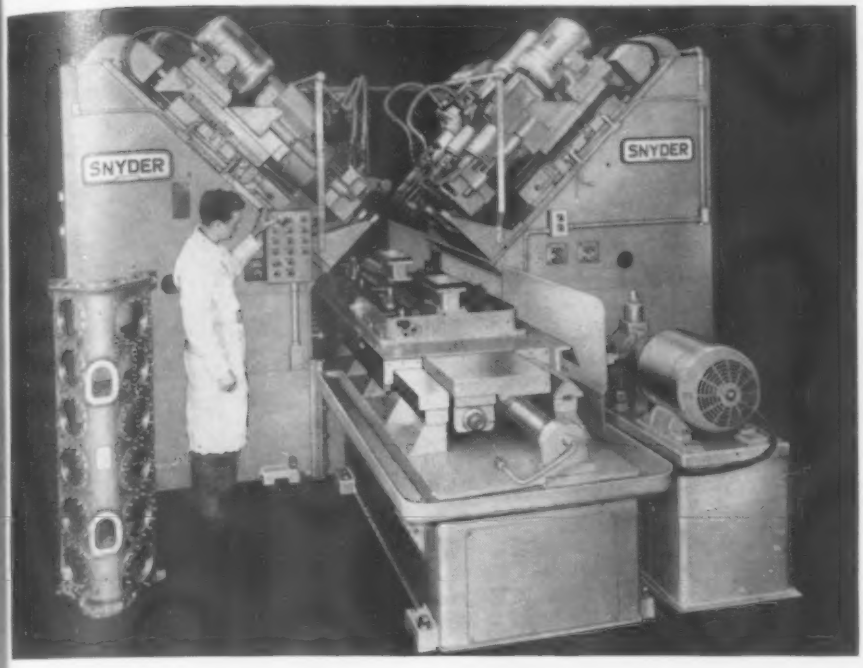
A Sharpening Fixture—AB-1—developed by the Bokum Tool Co., Detroit 21, Mich., to facilitate the sharpening of Bokum single-point boring tools, consists of a rectangular base which is placed on a magnetic bed at right angles to the wheel. After being put into a special adapter, the tool to be sharpened is inserted into the inclined hole of the fixture far enough to make the cutting end rest against a carbide-tipped stop.



It is properly positioned with the cutting edge a few thousandths above the stop and aligned parallel to it. Before grinding, however, the wheel must first be placed at the right height in relation to the tool to make sure that the proper amount of metal is ground down. A diamond wheel dresser, in one corner of the fixture, serves as a guide in setting the wheel for the most efficient performance.

The resharpening fixture was designed expressly for all Bokum standard and extra long tools, Styles A and B from No. 00000 to No. 3. A manual giving helpful hints on resharpening all types of Bokum tools, can be had on request. T-2-20

11-Station Line Index Machine



A special-purpose, 11-station, line index, 90 deg V-type hydraulic feed machine by Snyder Tool & Engineering Co., 3400 E. Lafayette, Detroit 7, Mich., is designed to achieve greater efficiency in processing large aluminum crankcases. The machine is entirely automatic, after loading, for operation by unskilled help. Guide plates establish accurate positioning and a hydraulic shot bolt is provided to position the index slide before the heads start the operations. Clamping is manual.

The machine consists of a welded steel bed with hardened and ground steel ways upon which is mounted the hydraulic index slide. On each side of the bed are mounted angular, welded steel columns, each of which carries two counterweighted Snyder standard units which, in turn, carry 14-spindle heads. In addition, the columns carry two tapping units with two 14-spindle, individual lead screw tapping heads. The part is automatically moved through the eleven indexes required.

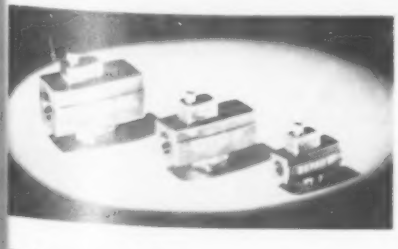
A total of 168 cylinder stud holes are drilled, counterbored and tapped at a 90 deg angle with high speed steel tools which are hydraulically fed into the work, and the entire operation is electrically interlocked for safety. Time cycle is stated as 2 minutes, 19 seconds, without loading and unloading time.

T-2-21

Speed Control Valve

An improved Speed Control Valve for use on pneumatic cylinders is announced by Hannifin Corporation, 1120 So. Kilbourn Ave., Chicago 24. Compact in proportions and streamlined, the valve employs a guided poppet of ample diameter to allow full, pipe-size flow toward the cylinder in the direction indicated by the arrow on the body.

The valve provides metered flow away from the cylinder by means of a large-diameter, tapered, valve stem which is threaded to permit sensitive adjustment from O cfm to maximum capacity. Two valves are used for speed control in both directions on double-acting air cylinders—one in each of the lines leading to the cylinder ports.



An "O" ring seal above the threads on the metering valve stem provides a unique safety feature. Well before the threads disengage, this seal is listed to a point where it no longer seals, so the escaping air around the valve stem will warn the operator that the point of maximum adjustment has been passed. A few reverse turns restore the seal, thus minimizing the danger that an operator will remove the valve stem while air pressure is on.

The "Type S" valves are constructed entirely of corrosion-resistant materials and suitable for use on pressures up to 150 psi. The poppet is faced with synthetic rubber to provide a positive seal and is loaded with a long-lasting phosphor bronze spring. All parts are readily accessible for inspection without breaking line connections. Complete specifications and dimensions of the valve, which is made in ¼, ⅜, ½ and ¾ in. pipe sizes, may be obtained from the manufacturer. **T-2-22**

Dual-Load Balancing Hoist

Designed for monorail operation, a Dual-Load Balancing Hoist, by the Platz Company, 20433 Sherwood Ave., Detroit 34, Mich., incorporates a low and a high pressure side to respectively balance a hook or cradle and the load to be carried.

Take, for example, a casting to be mass produced that weighs 150 lbs., and a special hook with which to grasp it, that weighs 40 lbs.—a total of 190 lbs. The low pressure side of the balancer would be adjusted to balance the hook, while the high pressure side would be adjusted to balance the load.

High and low pressure is applied by a convenient hand control. After the hook grasps the casting, the high pressure handle is pulled and the load is neutralized. Both hands can then be employed to drop the casting gently into a fixture with "cat-paw" action.

That implies that the casting is absolutely balanced over the fixture at any desired height from just touching, and up, to permit rotation and locating on next points or stops, and then gently dropped into place—no banging and "horsing" to locate in place. Once the load is in place release of the high pressure automatically applies the low pressure, when the hook is in balance. The hoist is a production tool designed to save time and effort on the assembly or moving conveyor line where speed of handling and manipulating into position is a requisite. T-2-23

Brinell Testing Balls

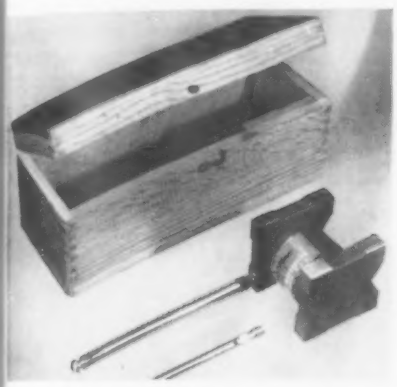
More reliable and consistent hot Brinell hardness testing of materials is claimed for balls made of "Kentanium", a heat-resistant material, basically titanium carbide, developed and manufactured by Kennametal Inc., Latrobe, Pa.

This material is said to combine unusual strength with high resistance to oxidation, thermal shock, abrasion, and corrosion—properties that make it suitable for a wide variety of uses where elevated temperatures are encountered.

T-2-24

Magnetic Base

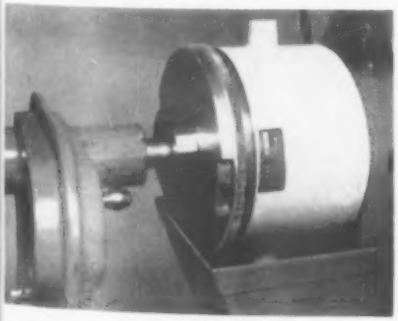
The du Mont Corporation, Greenfield, Mass., has introduced an improved "Minute man" Magnetic Base for quick, convenient application of dial indicator gages and other tools. As the illustration shows, a feature of the tool is its applicability to round as well as flat surfaces. This is effected by relocating the magnet barrel to allow for V slots on one side. Interchangeable brass shafts, 5/32 and 5/16 in. dia. are provided for ready attachment of any dial indicator gage or height gage.



This magnetic base makes it easy to instantly position the gage at the point for easy reading. It has a 40 to 50 pound grip on all four sides and its holding power does not diminish with service. In addition to use with dial gages, it holds work in position on surface plates, supplies magnetic power to rods for chip removal from drilled or tapped holes, holds coolant pipe nozzles on machine tools and does other handy jobs around the shop. **T-2-25**

Push-Pull Air Cylinder

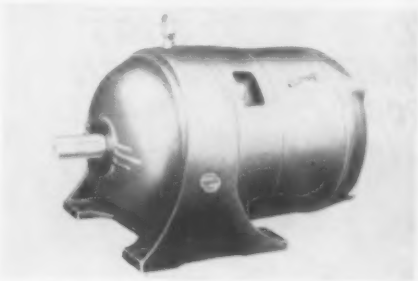
The Erickson Air Cylinder, a product of Erickson Tools Division, 2311 Hamilton Avenue, Cleveland 14, Ohio, uses the mechanical advantage of levers, or dogs, to give increased gripping power. So designed, the cylinder is said to develop three to four times the drawbar force of a conventional air cylinder with the same piston area.



The piston is of the "donut" design, which permits bar stock and work to be passed through the unit. It has a movement of 1/8 in. in either direction, and may be used for either push or pull type mechanisms; thus, it is ideal for operating both collet chucks and expanding mandrels. **T-2-26**

Broad Line of Gearmotors

Foot Bros. Gear and Machine Company, 4551 S. Western Blvd., Ancap 9, Ill., and the Louis Allis Company, 427 E. Stewart St., Milwaukee 7, Wis., have announced a joint program for the manufacture and sale of a complete line of gearmotors.



Manufactured in 17 sizes, these gearmotors provide single, double and triple reduction units having output speeds from 780 down to 7.5 rpm. Integral horsepower ratings are available for practically any industrial application.

The F.B.-L.A. gearmotors incorporate hard helical gears and other moving parts which have been processed and heat treated under improved methods of manufacturing control. Thus, there is attained high standards of performance with regard to load carrying capacity, wear life, quietness of operation and compactness of design. Information is available from either company.

T-2-27

KM Disc File

A Disc File, developed by Kennametal Inc., Latrobe, Pa., provides for faster, less costly operations on non-ferrous metals and plastics commonly performed by grinding, such as snagging castings, cutting off flashing, facing and squaring up surfaces. The expense involved in frequent replacement of abrasive wheels is thereby immediately reduced if not eliminated.

Triangular prisms of strong, hard Kennametal—90.0 Rockwell A—are copper-brazed to the face of a steel back-up plate, in a number of courses to form a multiplicity of sharp, sturdy cutting edges. They are shaped, grouped, and positioned to provide a 30 deg negative axial rake, a 30 deg clearance angle, and 10 deg negative radial rake. This construction is said to afford the most efficient and free-cutting action.

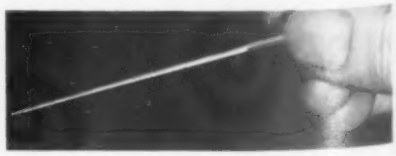
Material is removed in sizable chips—no abrasive dust—and a smooth, true surface is produced. Eccentricity of the intermediate courses of prisms assures uniform cutting action across the face of a workpiece. With the file run at proper speed, workpieces are said to remain cooler than with abrasive wheels because chips dissipate the heat of cutting.

Four sizes are available—6, 8, 10, and 12 in. diameters—for mounting on a grinder, abrasive disc machine, motor end, or disc file machine by means of a suitable adapter. Recommended speeds range from 5000 to 7000 sfm for the harder materials, and 8000 to 9000 sfm for soft or gummy materials. T-2-28

Versatile Tapered Reamer

A Tapered Reamer, suitable for removing burrs, improving fit, enlarging or cleaning holes from 1/64 to 1/16 in. diameter is now available from Woodruff & Strokes, Quincy 69, Mass. It can also drill holes in soft materials such as wood.

The five-sided "Tru-Reem" reamer can be used on wood, metal, glass or plastic, and is said to be equally suitable for either hand or machine use. The tools are especially heat-treated to provide a hard cutting edge and tough core which means long life. T-2-29



Gusher Pump by Ruthman

The Ruthman Machinery Company, Cincinnati 2, Ohio, announces a belt driven Gusher Pump—Model TIR-1—specially designed for liquids which are more difficult to handle and furthermore injurious to a conventional type pump.

The driving mechanism, which consists of an enclosed housing with a pair of hardened steel bevel gears of two to one ratio, supports both the horizontal and vertical shafts which, in turn, rotate on generous size precision ball bearings. Within the drive housing is incorporated an automatic lubrication system, which functions by a built-in small centrifugal pump adjacent to the oil reservoir window.

The auxiliary oil pump operates simultaneously with the vertical shaft and forces a small stream of oil up into the chamber containing the gears and ball bearings. As the housing is totally enclosed and dust proof, one filling of oil should be satisfactory for many months, without in-between lubrication. The slots in the tubular stem housing between the driving mechanism and the pump impeller housing are to permit easy cleaning when required.

The capacity of this pump through 1 in. vertical pipe at 4 ft. head, operating at 500 RPM pulley speed, is 10 gpm. At the same head and a pulley speed of 1200 rpm, the capacity is 44 gpm. Several standard size pulleys are available which include 5 in. and 7 in. pitch diameter, V-belt pulleys for size "A" belt; also, pulleys for flat belt can be furnished. **T-2-30**

Rotary Files and Burs

The Martindale Electric Co., 1375 Hird Ave., Cleveland 7, Ohio, has put out a utility set each of Rotary Files and Rotary Burs with a well rounded selection of 8 tools in each set. Cutting heads of burs are from $\frac{3}{16}$ in. All have $\frac{1}{4}$ inch shanks. The Martindale Bur Bulletin, available on request, lists these tools and over 200 other stock sizes of rotary burs and files. **T-2-31**

Hobart Electro-Mizer

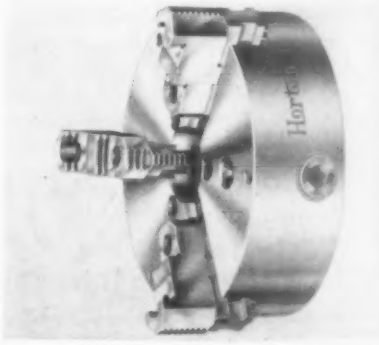
The Electro-Mizer by Hobart Brothers Company, Troy, Ohio, is a remote start-stop switch, mounted on a stand with arms providing finger-touch control. The weight of an electrode holder breaks the circuit and shuts off the welding machine.

It works as follows: When the electrode holder is hung up, it automatically shuts off the arc welding machine, and when the electrode holder is again picked up, it automatically starts the arc welding machine. Thus, the machine only runs when welding is being done. It can be connected to any motor-generator welder having push button starting.

In addition to the electrode holder, the stand provides a convenient place for a remote-control rheostat, electrodes, chipping hammer, wire brush, and other welding accessories. T-2-32

Flame-Hardened Chucks

Improvements in chucks manufactured by E. Horton and Son Co., Windsor Locks, Conn., include flame-hardened jaw ways, hardened and ground replaceable pinion bushings, grease fittings and wider top jaws of American standard design.



Since the jaw ways are the most vulnerable wear point of a chuck, the flame hardening—which is said to in nowise impair the accuracy of the body—prolongs life and maintains initial accuracy. The other improvements also tend to prolong useful life beyond ordinary expectations. T-2-32

Small Carbon-Steel Taps

Increased tap life and more precise threads are claimed for line of small taps recently introduced by Woodruff & Stokes, Quincy 69, Mass. Available in standard or special sizes up to No. 2—.086 in. and with up to 260 threads per inch, these taps are said to be accurate within .002 in. on pitch diameter and to make possible savings in lower initial cost and in increasing production runs. Taps having special pitch diameter or thread profile are available on special order.

The improved performance or W-S Small Taps is said to be due to advances in design and manufacturing processes. The cut thread and flutes are highly polished to reduce drag and fatigue. Cutting edges have great strength due to the radial chamfer and extra chip clearance is provided by the radial flute. In addition, special heat-treating methods have been developed which, applied to carbon steel, produce an extremely hard cutting edge and increased toughness throughout the length of the tap. **T-2-34**

"High-Low" Electrode

Steel-Tectic, a high-speed electrode said to weld bead over bead has been introduced by Eutectic Welding Alloys Corporation, 40 Worth St., New York 13, N. Y.

As claimed by the maker, the $\frac{5}{32}$ in. Steel-Tectic electrode can be used at as low as 50 amps on thin steel without danger of burning through, as compared with conventional electrodes requiring 100 amps, with risks of burning through. Yet for piecework production, the electrode can be run fast, at high amperages, as a thin depositing electrode with a very short arc.

A Eutectic Frigid Arc flux coating, that forms a protective envelope around the weld area and permits a spray deposit free of weakening oxides and inclusions, makes it unnecessary for the welder to stop and brush or chip away the slag. **T-2-35**

Vibration Measuring Units

Aircraft Electronics Associates, Inc., 1031 New Britain Ave., Hartford 10, Conn., announce production of the Sono Probe Correlator, for use in correlating two or more vibration-measurement instruments such as the Sono Probe. The latter, which is the company's major product, is an electronic amplifier with contact pick-up designed to permit location, isolation, measurement and analysis of any vibration regardless of airborne sound.

The Correlator, which is essentially a constant frequency signal source with a variable intensity output which is metered and fed to a specially designed vibration head, permits feeding to a vibration-measurement device a vibration of known frequency and intensity. Because of its metered output, an acceptable standard of noise or vibration can be expressed in terms of Correlator output and can be reproduced at will, regardless of variation of line voltage, temperature, humidity or location.

By applying the Correlator to two or more Sono Probes and adjusting their volume control, they can be calibrated within plus or minus 2 percent even if, as claimed, they are located in plants in different cities, thus assuring absolute uniformity of test or inspection results. It also permits daily checkup on the operation of any vibration-measuring instrument to insure against possible variations due to usage, shocks or temperature or weather changes. T-2-36

All-Purpose Coolant Base

Safco 770 Compound is a water-soluble coolant base, with the consistency of a liquid paste, said to combine in a single water-soluble product all of the essential qualities of a grinding compound and a sulphurized cutting oil, yet without their objectionable features!

When used in grinding operations and mixed with water in ratios as high as 80 to 1 it is claimed to prevent wheel-loading; to reduce wheel-dressings; to keep work from rusting; and to keep solutions sweet and free of foul odors. In machining operations, the solutions are said to exhibit the same fine lubricating and anti-weld properties of sulphurized oils without smoke, odor, dermatitis, or burnt hands. Further information from Swan-Finch Oil Corp., R.C.A. Bldg. West, New York 20. T-2-37

Precision Lapping Machine

A 24 in. Hand Lapping Machine by The Taft-Peirce Manufacturing Company, Woonsocket, R. I., was designed to impart the last critical element of precision and finish to plane and cylindrical surfaces of small and medium-sized parts. Speed and capacity are suited for rapid processing in small lot manufacture as well as for tool room requirements. The machine is particularly well adapted for the finishing of plug gages, mold details, fuel pump housings, valve fittings, or any other work requiring precision finishes or true contact surfaces.

Built for compactness, the T-P lapping machine is only 37½ in. high. Weight is approximately 600 pounds. Lapping plates are 24 in. in diameter and are furnished either plain, for cylindrical work, or grooved for flat work. Constructed of close-grained cast iron of an analysis especially suited for fine lapping operations, they are carefully heat-treated to prevent distortion from seasonal changes and are precision ground. **T-2-38**

Demagnetizing Coil

A compact Demagnetizer for precision parts which have had magnetism induced in them either through use of magnetic chucks or grinding, or other high speed machining operations, is available from Dings Magnetic Separator Co., 4740 West Electric Ave., Milwaukee, Wis. Engineered for maximum demagnetizing force, this unit provides a convenient method of overcoming the dangers of chips or magnetic dirt adhering to parts, causing scoring or failure of close tolerance machinery.

The unit is installed at a 45° angle, the parts to be demagnetized being placed in the aperture and allowed to fall through. For continuous duty it is installed horizontally with a rubber conveyor belt moving through the coil. There are no moving parts in the unit itself, and wires are glass insulated.

Available in 3, 5, and 6 in. sizes, 220 or 440 volts A.C. Bulletin B 1903-A gives complete details. **T-2-39**

Andy-grams

Mr. A. E. Rylander,
ASTE Headquarters.
Dear Andy:

I am enclosing herewith a copy of Cleveland Chapter announcement for December '49. I particularly call your attention to the article . . . by Andy Clark, Secretary of Cleveland Chapter . . . believe that you could use the entire piece in your Andygrams. This is a very well written article . . . descriptive and expresses deep sentiment. If Andy Clark can write like this he certainly should be a contributor to our magazine regularly.

Very truly yours,
W. B. McClellan,
Nat'l Sec'y, ASTE

Dear Mac:

Just for the record, may I humbly suggest that nobody is supposed to tell me what to put in the Andygrams? However, I'm always wide open to leads, and especially such as above from a right guy like yourself. Thanks a million!—and I'm sure Mr. Clark will be pleased at the deserved recognition from a Society officer.

As you state, it's really a nice story and I'm sure our readers will enjoy it as much as we did. Anyway, I'm right proud to introduce Mr. Clark as a "guest artist" in my page, and to hand him a pleasant surprise, I'm reprinting his story practically *in toto*. As one Andy to another, Andy, come again!

Most cordially yours,

Andy

A Visit to the Tomb Of the Unknown Soldier

By Andy Clark

Mike and I were visiting Washington, D. C. in the spring to see the cherry blossoms around the Tidal Basin and to take in all of the sights—two typical Ohioans, gawking at everything. We had just viewed the Lincoln Memorial in Washington and had driven over the low, wide bridge over the Potomac into Virginia. At the end of the short ride, we turned left and passed the entrance gate into Arlington Cemetery.

Half way up to the top of the hill, we spied what looked to be a ship's mast. Coming closer, we saw that this was actually what it was. We parked the car and walked over. True enough, this section of the cemetery had been dedicated for those who had died on the battleship USS Maine which had blown up in Cuba harbor in the war of 1898. Many were the inscriptions on the monument erected there. We were impressed with the large number of headstones marked "Unknown".

We then started to walk to a large amphitheatre. This was of solid white marble. Strolling down the centre aisle and looking all around us at the row on row of marble seats and boxes, we got a fleeting glimpse of the glory which must have been Rome's at its height. Making our way toward the front of the amphitheatre, we approached a door, leading to —we knew not where. As we stepped through this door, we were totally unprepared for the sight we were about to witness.

There, in the bright spring sunlight, below us, in solid white marble, lay the tomb of the Unknown Soldier. And there, close by, burned the Flame of Eternal Light. A goodly crowd had gathered, but all stood—bare headed. Not a sound could be heard. Suddenly, the soldier on guard snapped his rifle into the "Present Arms" position and the bolt cracked on the spring air. With the piece on his shoulder, he then faced about and with rapid, precise steps, marched to the opposite side of the Tomb. The soldier did a "Right Face" to the East and stood motionless—on guard. This routine was repeated at set intervals.

Working our way eventually to the side of the Tomb, we read these words—"Here Rests In Honored Glory An American Soldier Known But To God."

Standing next to us was a freckled face boy. The expression on his face as he watched the soldier on guard was one of admiration—really hero worship. Every father has seen this look on the face of his boy sometime or other. Neither the Significance of Things nor the Bitterness of Life were yet upon him. He saw only the splendid youth with the rifle on his shoulder—representative of his regiment, in this guard of honor.

A short way to our left stood a young girl and the light in her eyes told of infatuation—also for the youth with the rifle. Life for her was just beginning—she knew not of disappointment-frustration. She had not thought much of the symbolism of the Tomb nor of why most of us had journeyed here from afar.

To the right of us stood a young couple —with fingers entwined. New shoes—honeymooners! To these folk this scene surely had a meaning. They realized that they were just starting out on life and with a confident, hopeful outlook, were ready for come what may. As they stood there, solemnly contemplating the meaning of the Tomb and its precious contents, it gave one a sense of security to know that of such, the very foundation of our Nation is made. Just as long as fresh, young wholesome youngsters marry, establish homes and raise children—just so long will our Nation prosper.

Across the way from us stood an old man. His eyes were closed but the deep lines etched in his face told a story of silent grief. The sparse gray hair on the bent head gave evidence of his burden. His thoughts were of his boy—maybe here in the Tomb before us! Most men have learned by devious ways to keep their own counsel. Dad here, will carry his grief to his grave.

Near the standing soldier on guard was a little old lady. Not wearing the kind of clothes you would expect to see along Fifth Avenue but giving the impression of plain, solid stock—the kind of folk you would find in the middle west—Kokomo, Indiana for instance—where the people have their feet firmly on the ground and know what the score is. As you looked at this little mother, a kindly feeling permeated your entire being. The kind of person when a fellow needs a friend. Tears filled the eyes of this woman and as they fell from her cheeks onto the faded coat, you instinctively knew that her thoughts were on the Tomb. Her boy! Missing in action. Surely dear God this must be him.

And what of the MAN in the Tomb? Who was he and what did he do? Did he crack the cat for gas in West Virginia? Did he set the bit that drew the oil in Oklahoma? Did he knock the block that sent a ship away at Sparrows Point? Did he tap the blast for iron, hot and fast at Cleveland? Did he face the cutter that mined the coal in Illinois? Did he lower the motor into a Ford at Detroit for a buyer in Tennessee? Did he use the Eastman to cut the cloth at Rochester to make the suit in Macy's window? Did he raise the herd that copped the prize at Land-O-Lakes? Did he sluice the logs in Oregon that built the tipple in Pennsylvania? Was it his toe that won the game for Notre Dame? Were his fingers on the strings that thrilled them all at Carnegie Hall? Were his wrists behind the hit that won the series for his team? Was his fist in the glove that made the challenger champ at the Garden?

Was he white, black, red or yellow? Protestant, Catholic or Jew? Does it matter? He symbolizes all of our glorious youth who gave their all that we might live in freedom. Let us appreciate what these heroes have done for us. Let us not waste time with the racial question—look at the Tomb!

Just think, twenty-four hours a day, day in and day out, winter and summer, some one stands on guard here! The Flame of Eternal Light burns incessantly, is never permitted to go out. The manifestation of a grateful Nation!

The shadows lengthen as we drive down the hill toward the gate. We pause and take one last look. There high on the crest stands the soldier—facing the East—at attention. The flame of light struggles ever upward, dancing in the gathering dusk. The tall pines like nature's sentinels cast long shadows along the hill in the descending sun. You can sense the peace of those all around us, cradled in mother earth. A breeze playing in the tree tops seems to whisper "WELL DONE" and the echo, gathering speed, thunders down the valley.

Written at Odessa, Del., Sept. 2, '49.

POTTER & JOHNSTON

3U SPEED-FLEX FULLY AUTOMATIC TURRET LATHE

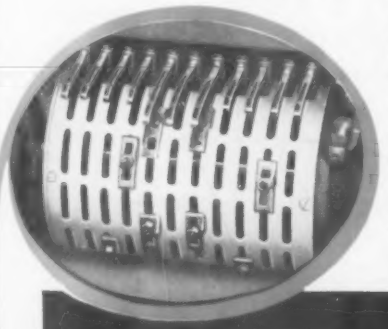
PAYS OFF 3 WAYS

1 **Fewer Rejects — accompanied by better work and more of it.**

2 **Increased Productivity — combining cuts, reducing machining times, eliminating unnecessary work handling.**

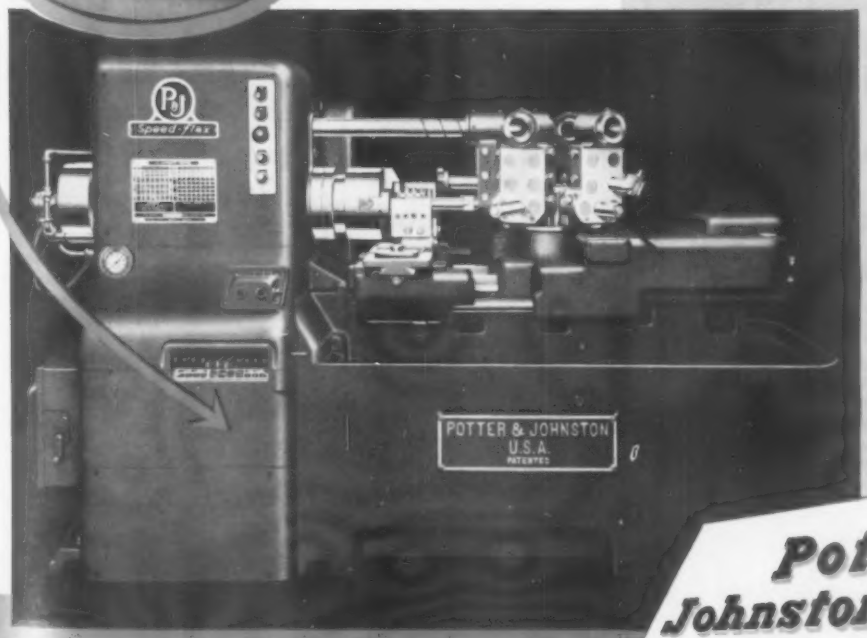
3 **Greater Economy — in tool life, tooling costs, operating costs, labor costs.**

INGENIOUS DOG DRUM PROVIDES PRECISION CONTROL OF TURRET TOOLS TO ATTAIN MAXIMUM PRODUCTIVITY WITH ECONOMY



Adjustable Dogs on Drum pictured at the left provide complete flexibility, and positive, fully automatic control of turret slide action in direct relation to spindle speeds — to meet all machining requirements, however intricate, at all turret positions. Details: Dogs are easily adjusted to select any of 4 spindle speeds . . . select any of 3 turret slide feeds . . . actuate turret slide feed . . . actuate turret slide rapid traverse . . . stop turret slide . . . stop spindle.

P&J-engineered Tooling on the P&J 3U Speed-Flex is the most direct way to attain maximum Productivity-with-Economy on high speed, multiple-operation work up to 6" in diameter. Get a P&J estimate on any job in this class — and compare. You'll find that P&J's 50 years' experience in this field of production metal-working pays off.



Send sample parts or prints for P&J Tooling recommendation and estimate, and ask for your copy of the 3U Speed-Flex Bulletin.

PRECISION + PRODUCTIVITY = ECONOMY

in work up to 6" diameter on the

3U SPEED-FLEX AUTOMATIC

Potter & Johnston Company

Pawtucket, R. I.

subsidiary of Pratt & Whitney Division Niles-Bement-Pond Company

P&J

The *knurling* on the head of the UNBRAKO Socket Head Cap Screw saves valuable assembly time because the UNBRAKO can be screwed in faster and further with the fingers—the handiest of all wrenches—before a wrench is needed. The slip-proof knurling "gears" the screw to the fingers, even when they are oily or greasy . . . this is especially important in the smaller sizes.

So, use Knurled UNBRAKO Socket Head Cap Screws and *save time and money.*

Write for further information.

Knurled Head Socket Cap Screws
Flat Head Socket Cap Screws
Self-Locking Socket Set Screws

SOCKET **UNBRAKO** SCREWS

Knurled Head Stripper Bolts
Precision-Ground Dowel Pins
Fully-Formed Pressure Plugs

SPS

STANDARD PRESSED STEEL CO.

JENKINTOWN 37, PENNSYLVANIA

Ettco-Emrick

ELECTRIC

INDEXING FIXTURE

This newly developed electric index fixture offers many important time and cost saving possibilities. With it almost any drill press, tapper or similar machine can be fitted for precision indexing. It provides its own drive through an integrally-built electric motor. Synchronization of the indexing with the vertical movements of the machine's spindle is also accomplished electrically.

A modified geneva system provides fast, smooth, shockless and positive action. Positioning is precise enough to insure extremely close tolerance work.

Write for Bulletin No. 97—
It's FREE!

It has full information and prices on these new production-boosting Indexing Fixtures.

ETTCO TOOL CO.

593 Johnson Avenue, Brooklyn 6, N. Y.

Boston, Mass. • Portland, Conn. • Detroit, Mich. • Chicago, Ill.

DRILL & TAP CHUCKS • TAPPING ATTACHMENTS
MULTIPLE DRILLING & TAPPING HEADS
DRILLING & TAPPING MACHINES

NEW! DIFFERENT! NEW! DIFFERENT!

Effortless AIR CONTROL VALVES!

NEW! DIFFERENT! NEW! DIFFERENT!

Hand Operated

TYPE NH—A new hand-operated, four-way, directional air control valve. Sizes ½" and ¾". ⅜" lever motion.

Foot Operated

TYPE NF—A new foot-operated, four way, directional air control valve. Sizes ½" and ¾". With or without pedal guard.

HERE is the newest thing in air valves for operating single or double acting air cylinders! Built for *hand or foot* operation, these instant-acting valves provide fast, effortless control comparable to an electric valve—*at minimum cost.*

DISC TYPE; SELF-LAPPING—Metal-to-metal seat. Air tight. Packless.

PILOT CONTROLLED; PISTON OPERATED—Only light touch required; air does the work—shifts the main valve.

PRECISION ENGINEERED—Simple, compact, self-contained; rugged! Try one today. *Ask for bulletins.*

HANNIFIN Corporation

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GAMMONS REAMERS

Originators and Manufacturers of Helical Reamers and End Mills

Helical Taper Pin Reamers Shipped by Return Mail

The
GAMMONS-HOAGLUND
Company

400 Main Street, Manchester, Conn.

DO YOU DO ANY INTERNAL GRINDING?

IF YOU DO, YOU'LL WANT THIS NEW CATALOG

2

THE INDEX

The following index is so arranged that the illustrations and dimensional data covering many Pope Precision Internal Grinding Spindles can be readily located by either the Type of Spindle (Removable Extension Arbor — Solid Extension — Deep Hole), by the Grinding Machine to which the spindle is applicable, or by Style Number.

GENERAL ARRANGEMENT OF CATALOG

Removable Extension Arbor Type Spindles — Pages 7 thru 20
Removable Extension Arbors (Quills) — Pages 21 thru 24
Removable Collet Chucks — Page 25
Solid Extension Type Spindles — Pages 26 thru 53
Deep Hole Type Spindles — Pages 54 thru 66
Spindle Mounting Brackets — Page 67

SPINDLES BY MANUFACTURER OF GRINDER

BROWN & SHARPE MFG. CO.
Universal Grinders No. 1 and 13
Removable Extension Arbor Type — Page 7
Solid Extension Type — Pages 26 and 27
Deep Hole Type — Page 54
Universal Grinders No. 2, 3 and 4
Removable Extension Arbor Type — Page 8
Solid Extension Type — Pages 28 and 29
Deep Hole Type — Page 55

BRYANT CHUCKING GRINDER CO.
Internal Grinder No. 12
Removable Extension Arbor Type — Page 9
Solid Extension Type — Pages 30 and 31
Deep Hole Type — Page 56
Internal Grinder No. 16
Removable Extension Arbor Type — Page 10
Solid Extension Type — Pages 32 and 33
Deep Hole Type — Page 57
Internal Grinder No. 112
Removable Extension Arbor Type — Page 11
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CINCINNATI GRINDERS, INC.
Universal Grinder No. 10
Removable Extension Arbor Type — Page 12
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Universal Grinders No. 12, 14, 16 and 18
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HEALD MACHINE CO.
Internal Grinders No. 70, 70A, 72, 72A, 75, 75A, 81 and 172
Removable Extension Arbor Type — Page 14
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LANDIS TOOL CO.
Universal Grinders No. 1, 1½, 2, 3 and 4
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NORTON COMPANY
Type "C" Multipurpose Grinder
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10 x 20 Universal Grinder
Removable Extension Arbor Type — Pages 17 and 18
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RIVETT LATHE AND GRINDER CO.
Internal Grinder No. 1024
Removable Extension Arbor Type — Page 19
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General Purpose Spindles other than those listed for specific Grinding Machines are available and illustrated herein.

Removable Extension Arbor Type — Page 20
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INDEX BY STYLE NUMBER

Style Number	DESCRIPTION	PAGE
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32-75H	Spindle Mounting Bracket (for flanged spindles)	67
441-27	Tapered Shank Removable Collet Chucks (in various sizes suitable for gripping tools with shanks from 1/64 to 9/16 inches in diameter)	67
C-1001 thru C-1005	Removable Extension Arbors (Quills) 7/16 inch Series	25
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P-1240 thru P-1278		24

No. 66

Look at this index page and you'll get some idea of the scope, utility and time-saving value of this new Catalog.

POPE Internal Grinding Spindles with super-precision bearings properly mounted and preloaded and having the Pope System of Sealed-in Lubrication are designed, built and dynamically balanced to increase your production and reduce your costs.

GET YOUR COPY OF THIS NEW REFERENCE BOOK
MAIL THIS COUPON

POPE MACHINERY CORPORATION E
261 River Street, Haverhill, Massachusetts

Gentlemen: Please mail me, without obligation or personal follow-up, your new CATALOG No. 57

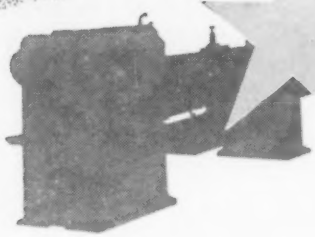
Name ..... Position .....

Company .....

Address .....

They're here!

THE NEW 1950 LeBLOND HEAVY DUTY ENGINE LATHES



IN 12", 14", 16" AND 20" SIZES
WITH MORE SPEED AND GREATER POWER
HARDENED AND GROUND STEEL BED WAYS
TOTALLY ENCLOSED QUICK CHANGE BOX
INCREASED EASE OF OPERATION
TRADITIONAL LeBLOND LONG-LIFE ACCURACY

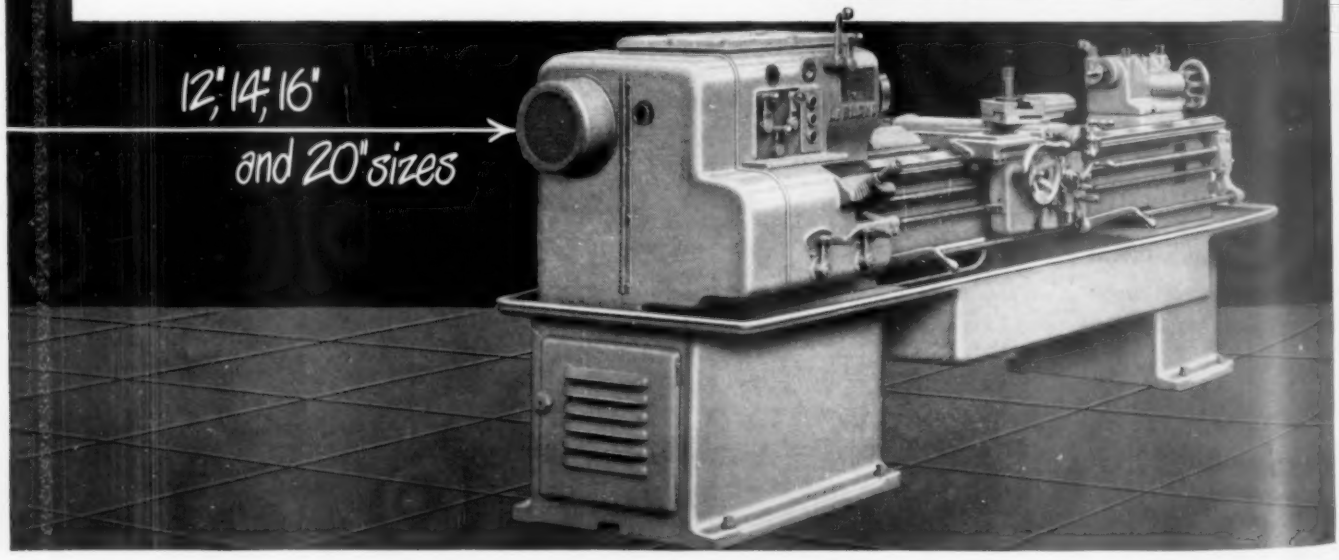
"THE MOST MODERN LATHES on the market today!" That's what leading buyers are saying about the new 1950 LeBlond heavy duty engine lathes. They're beautiful in appearance. They're outstanding in the way they remove stock: quickly, easily and economically. They'll be the most useful lathes in your plant because they'll perform a wider variety of work. If you're looking for further reduction of your metal turning costs, you'll welcome the new LeBlond heavy duties. There's a size for every requirement.

	12"	14"	16"	20"
Swing over bed and carriage wings	14½"	16½"	20½"	22½"
Spindle speeds, number	12 or 24	12 or 24	12 or 24	16 or 32
Spindle speeds, range, rpm	25-1250	25-1250	16-1010	9-800
Feed and thread changes	60	60	60	60
Feeds, range	.002"-.126"	.002"-.126"	.0027"-.152"	.004"-.250"
Threads per inch range	2-120	2-120	1-60	1-60
Motor recommended	7½ hp	7½ hp	10 or 15 hp	15 or 20 hp

Send today for descriptive bulletins.

THE R. K. LeBLOND MACHINE TOOL CO., CINCINNATI 8, OHIO, U.S.A.
LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES
SALES OFFICES: New York, Chicago, Detroit.

LeBLOND



THESE *Extra* CONTROL FEATURES

at No Extra Cost . . . IN OILGEAR BROACHING MACHINES

Ever since Oilgear pioneered fluid power broaching many years ago, Oilgear has constantly sought to anticipate new needs in the broaching art . . . in order that this versatile tool might be made progressively better and more productive. Today, Oilgear Broaching Machines incorporate, as *STANDARD*, many features not furnished in other machines or only available at extra cost.

FEATURES OF OILGEAR ELECTRO-HYDRAULIC CONTROLS

(The product of Oilgear's superior design and engineering)

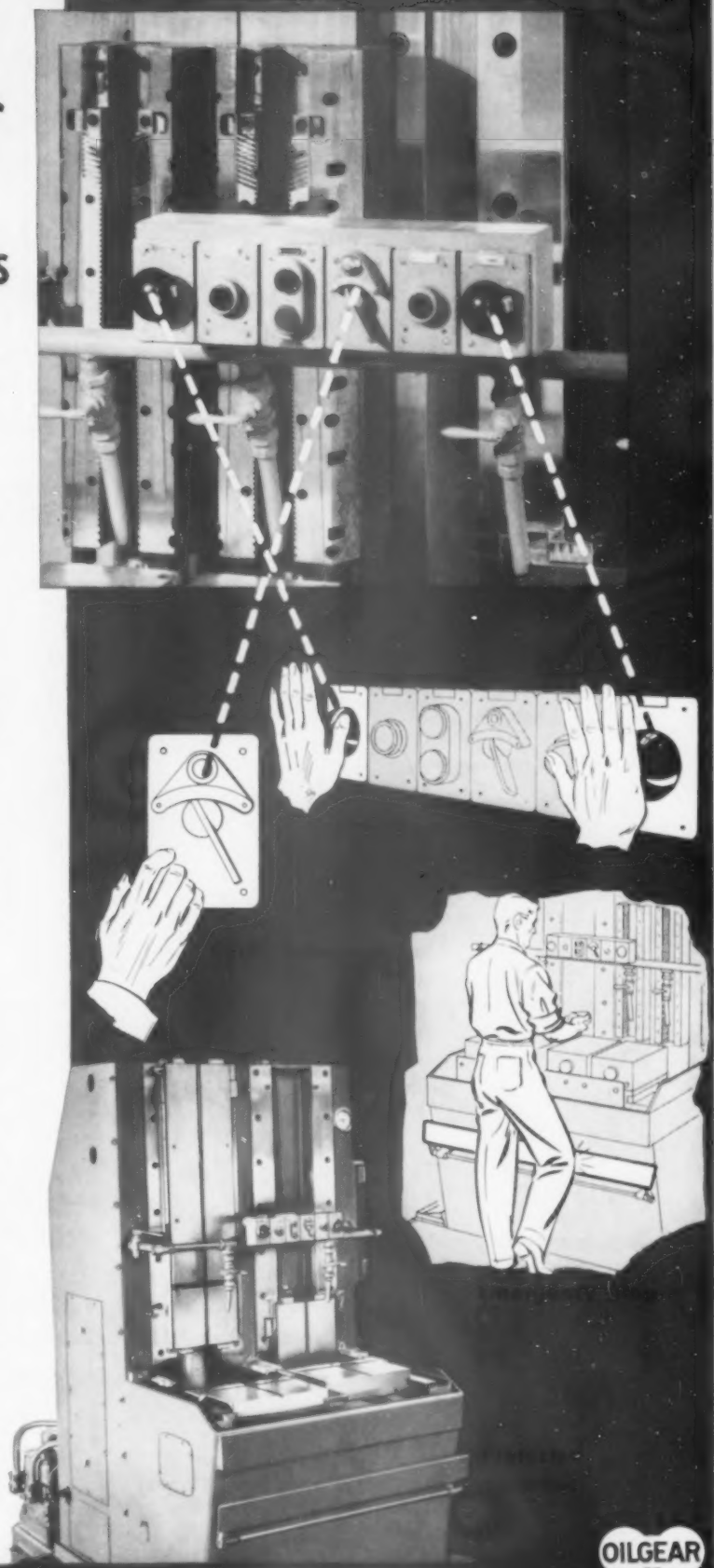
CYCLE SELECTOR. Manual push-button, semi-automatic or full-automatic operation is selected quickly with ease through a nearby switch. There are no pilot and sequence valves and load and fire mechanisms to reset or cause trouble. Selector switch can be locked to prevent tampering by operator and damage to tools and fixtures.

SAFE CONTROL. Dual push-buttons protect operator against accidental starting of machine. Safe starting of broaching cycles is simple. There are no control levers, links, springs and valves to require overtravel, tire the operator and reduce production. Response to controls is instantaneous and positive; there's no needless, time-taking overtravel of tool.

EMERGENCY STOP. Operator can stop machine instantly at any point in cycle with emergency push-button or knee bar. There's no bending or balancing on one foot to depress a pedal or struggle to shift a lever. It's another factor of safety for operator and machine.

PROTECTED SWITCHES. Limit switches are mounted inside machine; protected from cutting fluid, chips, chip dust and other causes of damage. Relays are concealed in control panel on side of frame for easy inspection.

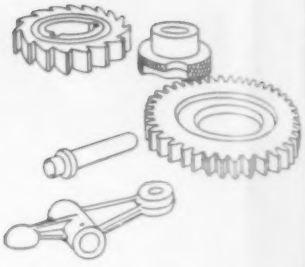
These are only a few of the many exclusive features of Oilgear Fluid Power Variable Speed Broaching Machines. Write for complete descriptive bulletins. THE OILGEAR COMPANY, 1573 W. Pierce St., Milwaukee 4, Wisconsin.



OILGEAR

Oilgear Fluid Power

High Productivity Proved in Over 100 Production Tests



NOW READY FOR YOU

V1 BOND

INTERNAL GRINDING WHEELS

A marked increase in efficiency in all types of internal grinding is provided by these new V1 Bond wheels. In a variety of materials and applications, the number of pieces per wheel have been substantially increased. A new process insures better duplication, better grinding action, and shorter delivery time. These wheels are equally efficient from starting diameter to minimum usable size. The Carborundum Company, Niagara Falls, New York.

CHECK THESE 5 POINTS

- **More pieces per wheel.**
- **Faster, freer, cooler cutting.**
- **Lighter dressing—longer diamond tool life.**
- **Greater range of work from one grade.**
- **Improved surface finishes and closer tolerances.**

Contact Carborundum's nearest office or distributor to avail yourself of these benefits.

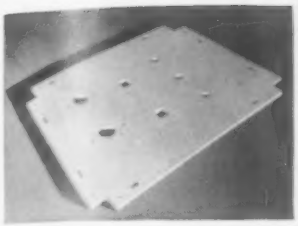
BONDED ABRASIVES BY

CARBORUNDUM

TRADE MARK

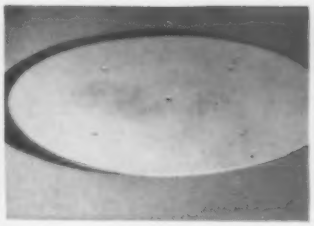
Branch Offices in: Atlanta, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Detroit, Los Angeles, Jersey City, Philadelphia, Pittsburgh, St. Louis, San Francisco.

"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company



The first **radio chassis,** 10"x 14", with 27 holes and 4 notches shown above was produced including setup in only 9.3 minutes and subsequent pieces in only . . . **1.8 min.**

A part of a piece of **farm equipment,** 72½"x 22", with 32 holes and nibbled cut-out was finished including setup in only 12.01 minutes, subsequent pieces in **2.32 min.**



Above circle, 24" in diameter with OD nibbled and 5 holes punched was produced in only 4.26 minutes including setup and subsequent pieces in only **2.38 min.**

An **electric refrigerator** part, 39⅜"x 8½" with 10 holes and 4 notches was fabricated including setup in only 5.61 minutes and subsequent pieces in only . . . . . **37 sec.**

An **automotive** channel, 28" long with 12 holes was fabricated including setup in only 3.37 minutes and subsequent pieces in only **29 sec.**

Can you match these WALES FABRICATOR TIME STUDIES *with your present methods?*

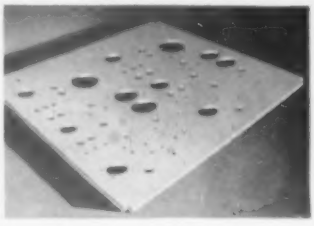
● These time studies were made under actual production conditions with average operators and were taken at random from hundreds of time studied parts.

There is nothing like this revolutionary Wales Fabricator. It punches, notches and nibbles. Wales exclusive Hydra-New-Matic Drive is unique in its simplicity of design and operation...so unique, in fact, that vibration and noise is practically eliminated at 165 strokes a minute. This drive plus the Wales patented "Quick-Change" System makes possible these startling "never-heard-of-before" time study figures.

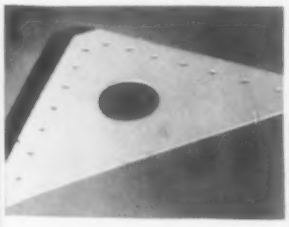
IT'S TOO BIG A STORY TO TELL ON THIS PAGE, so write for fully-illustrated, functionally-colored Catalog 10-A and discover for yourself why production schedules of this Fabricator have been more than doubled.

WALES-STRIPPIT CORP.
George F. Wales, Chairman
1593 PAYNE AVENUE, NORTH TONAWANDA, N.Y.
(Between Buffalo and Niagara Falls)
WALES-STRIPPIT OF CANADA LTD.
HAMILTON, ONTARIO
Specialists in Punching and Notching Equipment
●

VISIT OUR BOOTH 908
at the ASTE Show in Philadelphia
APRIL 10 - 14

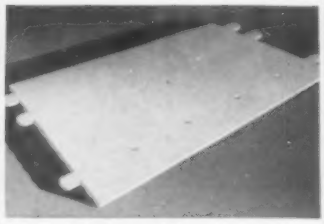


Above **electronic chassis,** 12½"x 11½", with 118 holes and 4 notches was completed including setup in only 32.45 minutes and subsequent pieces in only **6.44 min.**



An **aircraft** gusset plate 7½"x 4½" with 15 holes and 1 notch was produced including setup in only 3.52 minutes and subsequent pieces in only . . . . . **54 sec.**

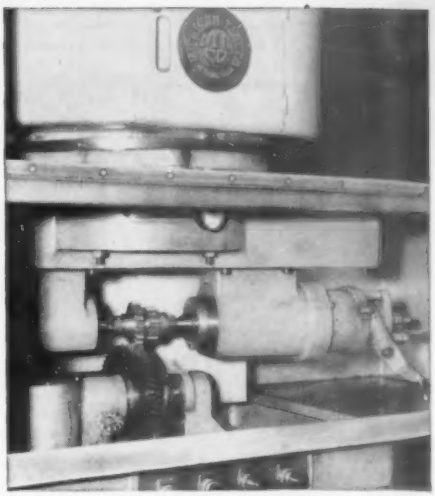
A piece of work, 11¼"x 24", with 9 holes and 4 notched, rounded corners was produced including setup in only 4.99 minutes and subsequent pieces in only **41 sec.**



The above piece of work, 22⅜"x 9½" with 4 holes and 2 sides notched and nibbled including setup was produced in only 6.10 minutes and subsequent pieces in only **1.2 min.**

CUTTING GEAR COSTS ISN'T Difficult

here's how one producer did it . . .



STEP NO. 2 **He reduced total cutting time and tool costs by ADDING underpass gear shaving.**

Time for hobbing plus underpass gear shaving on Michigan 870s is only 85% of previous cutting time.

Tool cost for both operations is less than for tools used previously.

STEP NO. 3 **He reduced pre-shave cutting and down-time *(and pre-shave tool costs)* with a Michigan Shear-Speed machine.**

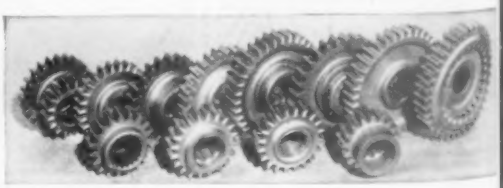
Cutting time is now only a little over a minute per gear (heavy duty gears). Equals output of 8 to 10 other gear cutting machines.

Operator effort reduced (operator actually "works" only one hour out of eight).

Down-time for change-over for Shear-Speed is below that on previous machines for same output. 70% of gears for 3 transmission types now cut on this one machine.

Entire cost of tools (initial and replacement) for the Shear-Speed were more than paid for by savings in sharpening time alone.

QUALITY? The complete new "Michigan" setup according to the gear producer gives him: More accurate involute and spacing (better contact); longer life; *variation off shaving machines of only plus or minus 0.0001 in.*

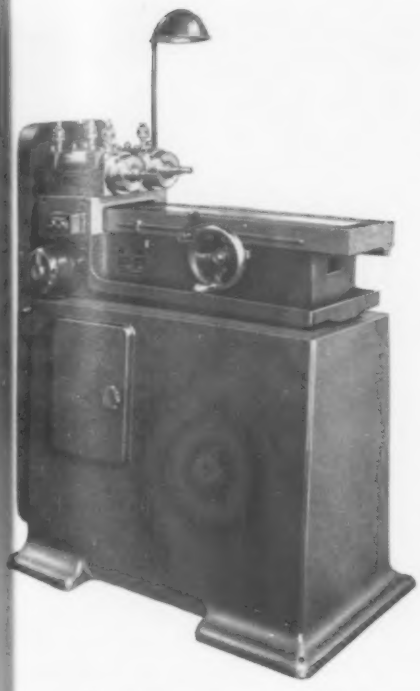


STEP NO. 1 *Oh yes, we should have put this first. Step No. 1 was to call in a Michigan Tool Company representative.*

COMPLETE from blank to finished gear EQUIPMENT

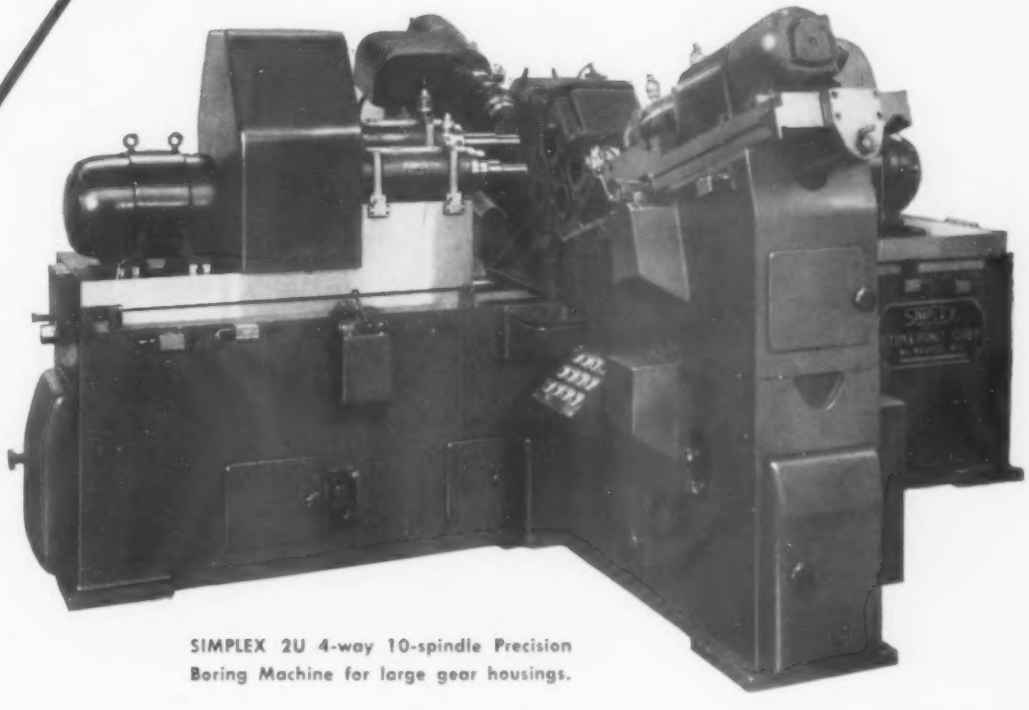
MICHIGAN TOOL COMPANY 7171 E. McNichols Road Detroit 12, U.S.A.

SIMPLEX



SIMPLEX 1L1 Precision Boring Machine for small parts and high production.

We build 25 sizes and types of SIMPLEX Precision Boring Machines, suitable for handling the entire range of precision boring work. Give us an opportunity to study your needs and recommend our equipment.



SIMPLEX 2U 4-way 10-spindle Precision Boring Machine for large gear housings.

Precision Boring Machines

STOKERUNIT CORPORATION

SIMPLEX Precision Boring Machines and Planer Type Milling Machines

4528 West Mitchell Street, Milwaukee 14, Wisconsin

...with the greater speed and feed you get from SIMONDS Inserted-Tooth Metal Saws

It takes Simonds Steels . . . especially hard for the teeth, especially tough for the plate; Simonds designed tools and machines; and many years of metal saw making experience to produce this heavy-duty metal-cutting saw. High Speed Steel Teeth with rounded gullets roll out chips which do not choke, bind or weld to the saw plate. Find out from your Simonds Distributor about these top quality Metal-Cutting Saws. Call him today.

SIMONDS
SAW AND STEEL CO.
FITCHBURG, MASS.
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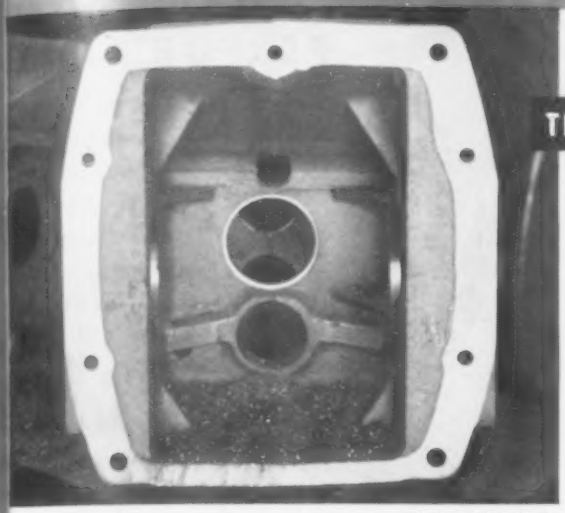
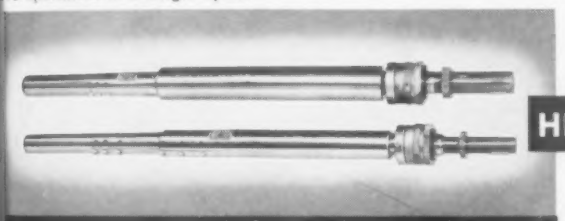
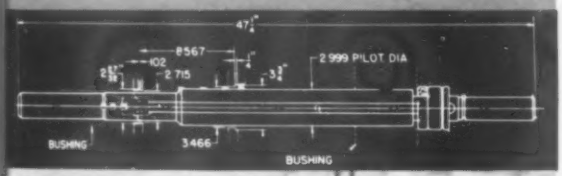
SIMONDS STEEL MILLS — Special Electric Furnace Steels
SIMONDS ABRASIVE CO. — Grinding Wheels and Grains
SIMONDS CANADA SAW CO. LTD. — Simonds Product's for Canada

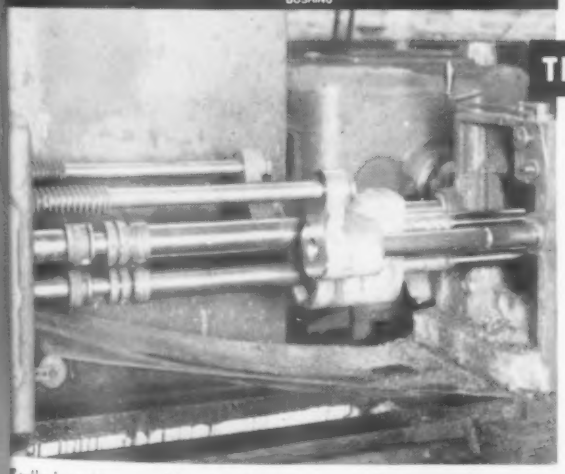
HOW WOULD YOU MEET THIS SPECIAL PROBLEM OF TOOLING AND PRODUCTION?



Tractor transmission case showing 4 holes in which S-J Tools do 15 operations in a single cycle.







Scully-Jones' two combination boring, counterboring and recessing bars in machine.

THIS IS THE PROBLEM:

A tractor manufacturer faced this situation when cutting recesses in two holes in a transmission case. After completing boring operations in a W. F. and John Barnes Machine, the case had to be picked up by crane and moved approximately 30 feet to a radial drill press. The shape of the piece made chucking difficult and increased possibilities for error. Loading and unloading was slow for the recessing operations which only took 10 seconds. This tied up a man and a machine, both of which could be freed for other profitable production if the recessing operations could be combined with previous boring operations.

HERE'S HOW IT WAS MET:

Two special bars were designed and manufactured by S-J to do the following operations: Each bar roughs, semi-finishes and finishes 2 bores, and cuts 1 internal recess. One of the bars also counterbores 1 hole as illustrated. The boring operations and recessing operations are now all performed on the case, at one pass of the bars in the W. F. and John Barnes Machine.

THE RESULTS:

By combining operations in one machine this tractor manufacturer got these advantages: (1) eliminated one handling operation, (2) freed one man and one machine for other production, (3) increased production, (4) improved accuracy of operations and reduced rejects by omitting one difficult chucking of the piece, and (5) saved tooling and production costs by combining operations on existing equipment.

MEET YOUR SPECIAL PROBLEMS TOO, WITH SPECIAL TOOLS

DESIGNED AND MANUFACTURED BY SCULLY-JONES

Draw upon S-J engineers' experience: Over 37 years designing and manufacturing production tools for the varied metal-working industries — such specials as: boring mill tools, internal and external recessing tools, quick change block boring bars, boring heads, step cutters, core drills, counterbores, spindle extension assemblies, tap driving tools and floating tools.

SEND SKETCH or sample work piece with details for a prompt quotation on your special tooling or production problem. You have a dependable source as to quality, price and delivery when you "put it up" to Scully-Jones.

Scully-Jones AND COMPANY

1915 S. ROCKWELL ST., CHICAGO 8, ILLINOIS

R-4081

YOU GET LOW COST, FAST, ACCURATE PRODUCTION WITH OUR STANDARD AND SPECIAL TOOLS

H&G DIE HEADS

WITH INSERT CHASERS

FOR ALL MACHINES USED FOR CUTTING SCREW THREADS

The famous H & G Die Heads come in styles and sizes for all types of machines, including threading machines, chucking machines, drill presses, turret lathes, and automatic screw machines, such as Brown & Sharpe, Cleveland, Cone, Davenport, Economy, Foote-Burt, Greenlee, Gridley, Acme-Gridley, New Britain, New Britain-Gridley, Swiss, etc.

The small, inexpensive high-speed steel insert chasers are held by rugged carriers and cut threads straight and true to the close tolerances required.

The majority of expert production men prefer these die heads because of the ease with which insert chasers are resharpened and set, the low cost of insert chasers and the greater quantity of threads per grind and number of pieces threaded per chaser dollar.

The reduction in inventory will pay for new die heads. **For example:** If you have $1,000 in chaser inventory, changing to H&G will require only $300, setting free $700 for the purchase of new H&G heads. This is due not only to low cost of chasers, but to interchangeability and long life.

Mark and mail for Free Copy:
- ☐ Bulletin 32 "Selecting Proper Die Head for the Job"
- ☐ Decimal Equivalent Wall Chart.

THE EASTERN MACHINE SCREW CORPORATION

27-47 BARCLAY STREET NEW HAVEN, CONN.

Mfrs. General Purpose Die Heads, Insert Chaser Die Heads, Threading Machines.

Special CUTTING TOOLS

H. S. S. or CARBIDE TIPPED

with

GUARANTEED PERFORMANCE

Detroit Reamer & Tool Co. has specialized in the design and manufacture of special cutting tools of H.S.S. and carbide for 12 years. This experience qualifies them to help you with the design of special cutting tools that are *guaranteed* by Detroit Reamer to give specified performance. In addition, their shop facilities are geared for the making of "specials" and that means lower costs to you . . . positive assurance for you of dependable cutting tools at lowest cost. Have our engineers look over your cutting tool problems or quote on your own designs.

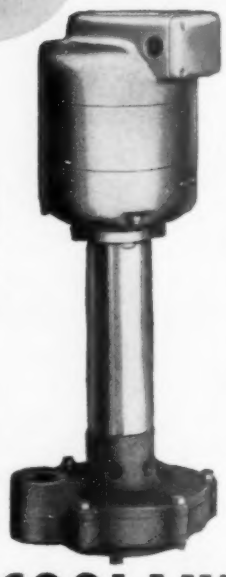
DETROIT REAMER & TOOL CO.

Mfrs. of Special High Speed Cutting Tools

2830 East 7 Mile Rd. Detroit 34, Michigan

RUTHMAN

THE NUMBER



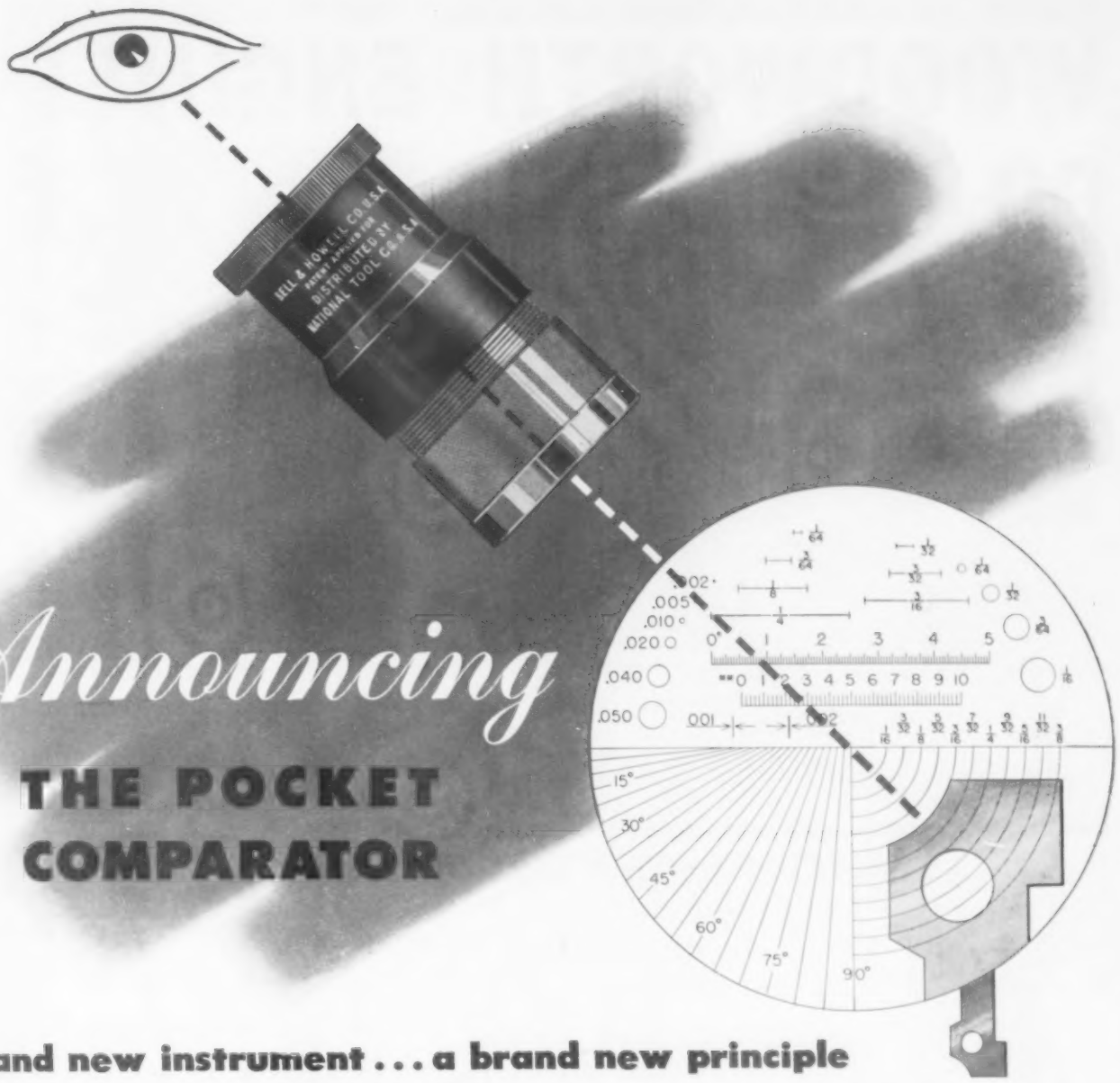
COOLANT PUMP

More and more of the leading manufacturers of metal cutting machinery are installing Ruthman Gusher Coolant Pumps as standard equipment on their machines. They find through experience that Ruthman Precision Built Gusher Coolant Pumps give better Production and longer pump life on metal working equipment.

Join these leaders in the machine tool industry. Specify Ruthman Gusher Coolant Pumps on all your machinery. Write for our catalogue now.

THE RUTHMAN MACHINERY COMPANY

1810 READING RD., CINCINNATI 2, OHIO



Announcing

THE POCKET COMPARATOR

A brand new instrument . . . a brand new principle to save you time and money inspecting small parts

HERE'S WHAT IT IS

The Pocket Comparator is a precision optical measuring instrument for the inspection of small parts. Measurements are accomplished through a combination of a high-precision six-power triplet aplanatic type magnifying lens and an engraved pattern or reticle. The reticle is calibrated for measuring lengths, widths, circles, radii and angles. Body of the Pocket Comparator is of machined aluminum with black anodized protective finish.

HERE'S WHAT IT DOES

TOOL ROOM USE:

Checks forms and dimensions of punches, dies, gauges, cutting tools.

Checks sizes and forms of templates, layouts, all kinds of cutting edges, etc.

PRODUCTION CHECKING:

Checks radii, angles, chamfers, threads, small holes, lineal, radial and tangent dimensions—often eliminates need for more expensive and elaborate measuring devices.

GENERAL USE:

For metallurgists and chemists—general laboratory work.

For textile and paper industries—for checking grades and flaws.

For die casting and plastic molding—general inspection.

For instrument makers, jewelers, etc., for checking size, grade, form, flaws, etc.

For printer, engravers and artists and general use in home workshops.

SEND FOR DESCRIPTIVE FOLDER ▶

National Tools Cleveland

☐ Send me Free Descriptive Folder

☐ Send me a Pocket Comparator. (Your check for $36.00 or your Company's purchase order must accompany your request.)

Name_____

Position_____

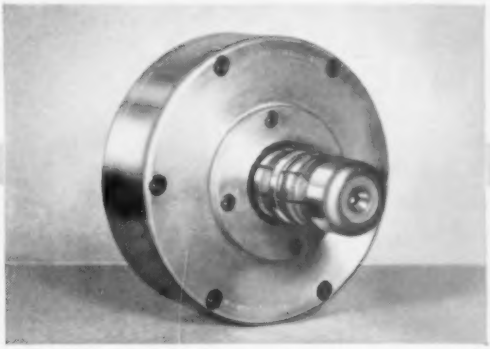
Company_____

Address_____

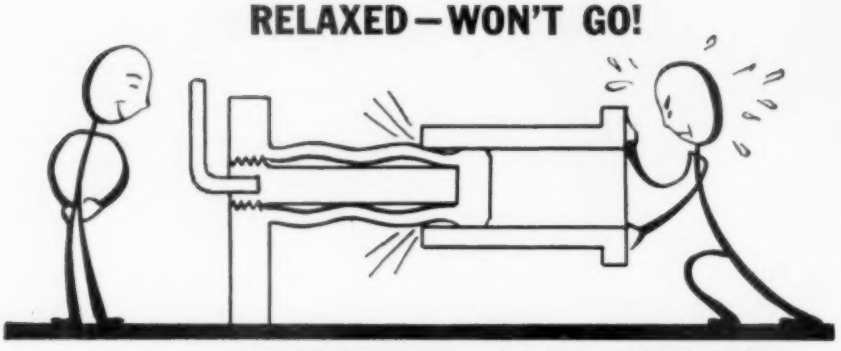
City_____ Zone____ State____

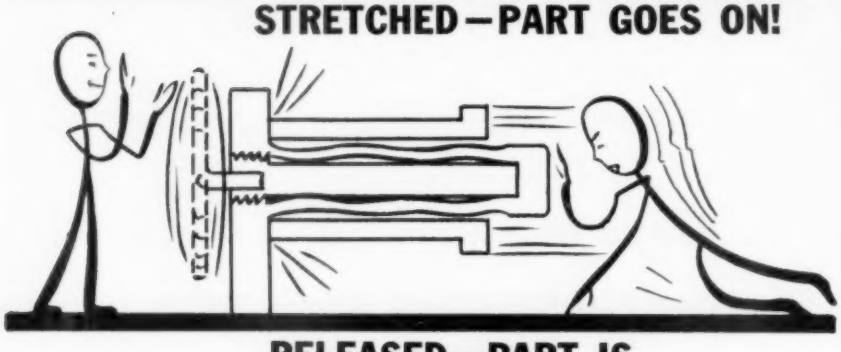
NATIONAL TOOL CO.

WOODWORTH ENGINEERS DO IT AGAIN!



THE N. A. WOODWORTH DIAPHRAGM ARBOR





NEW DOLLAR AND SENSE VALUE....!

- Designed for production grinding, facing and turning.
- Also ideal for inspection
- Compensates for I. D. tolerance
- Maintains concentricity and squareness
- No wear with flexing action
- Repeats indefinitely
- Air or screw operated
- Increases quality and quantity
- Reduces operation time and maintenance costs

Send your arbor problem to us—

Mail part print and description of operation.

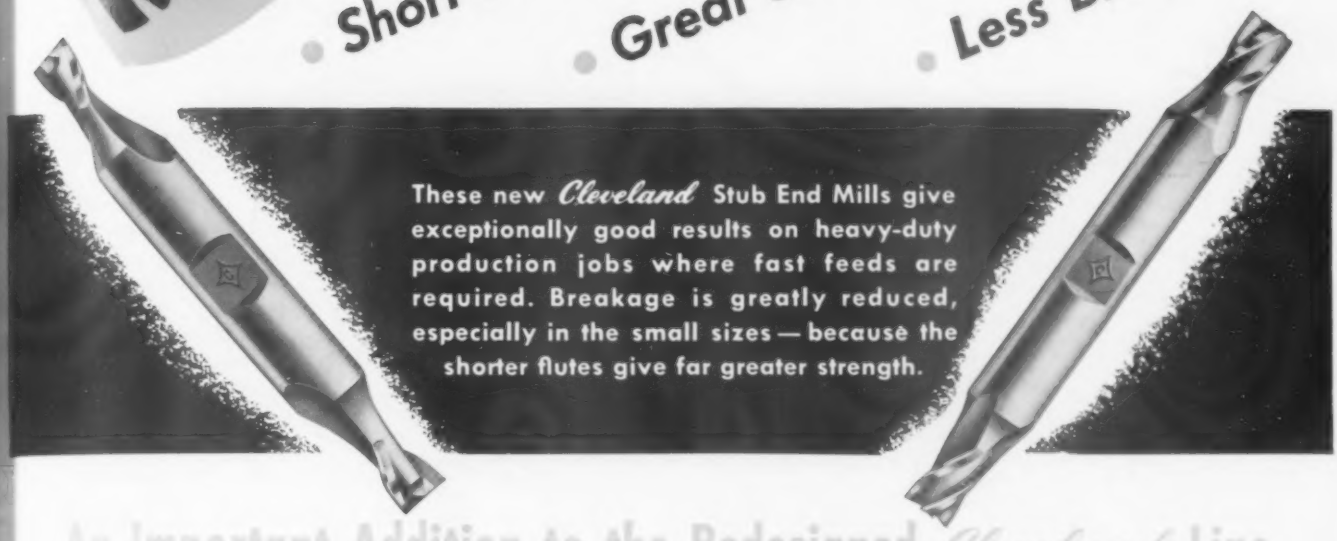
WOODWORTH

N. A. WOODWORTH CO. • 1300 EAST NINE MILE ROAD • DETROIT 20, MICHIGAN

PRECISION GAGES • DIAPHRAGM CHUCKS • CONE-LOK JIGS • PRECISION PARTS

NEW! *Cleveland* STUB END MILLS

• Short Flutes! • Great Strength! • Less Breakage!



These new *Cleveland* Stub End Mills give exceptionally good results on heavy-duty production jobs where fast feeds are required. Breakage is greatly reduced, especially in the small sizes — because the shorter flutes give far greater strength.

An Important Addition to the Redesigned *Cleveland* Line

The new Stub End Mills have all the features of the redesigned ***Cleveland*** End Mills that have enabled these tools to set new records of performance wherever they have been tested. They have been carefully engineered to give you *More Cuts per Grind, Consistent Accuracy, Faster Production* and *Greater Economy.*

STRONGER No sharp corners or points where localization of stresses might occur. Minimum amount of metal has been cut away. (Stub End Mills have an *extra* factor of strength due to their shorter flutes).

CLEAR CHIPS BETTER Redesigned flutes are machine polished. There are no pockets. Chips are free to move.

GREATER ACCURACY New clearance and accurate machine polish of flutes result in closer control of size.

MORE DURABLE New-style clearance supports the cutting edge; assures against "flaking" or "chipping out".

LONGER LIFE Radically new flute shape and chip clearing ability reduce wear on the cutting edge, thus maintaining consistent accuracy.

CUT FASTER New flute shape gives maximum cutting qualities at increased rates of feed.

Telephone Your

Industrial Supply Distributor

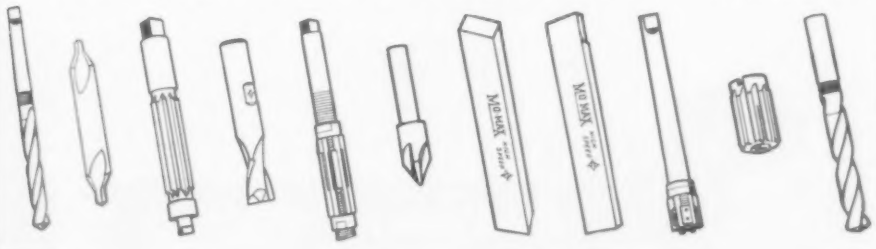
THE CLEVELAND TWIST DRILL CO.

1242 East 49th Street • Cleveland 14, Ohio

Stockrooms: **New York 7 • Detroit 2 • Chicago 6 • Dallas 1 • San Francisco 5 • Los Angeles 58**

E. P. Barrus, Ltd., London W. 3, England

ASK YOUR INDUSTRIAL SUPPLY DISTRIBUTOR FOR THESE AND OTHER *Cleveland* TOOLS



A-H5

(5 PCT CHROME AIR-HARDENING)

Economical, Easy Machining

a tool steel for high-production jobs

A-H5 is the backbone of this high-production die which blanks and punches sheet steel of 0.180-in. thickness. A-H5 assures long production between grinds, holds a durable cutting edge, and has high resistance to distortion in heat-treatment.

And that's not all. A-H5 provides the greater safety of air-hardening; and it wears longer and has better distortion-resistance than low-alloy, oil-hardening grades. A-H5 has deep-hardening properties in large sections, combined with shock-resistance equal to that of carbon tool steels. And with all these advantages, it's still easy to machine—it anneals to less than 212 Brinell.

A-H5 is an economical grade, because it's ideal for many tools and dies that would ordinarily call for high-carbon, high-chrome steel, such as Lehigh H. Demand for A-H5 is growing fast, for it has the high wear-resistance and durable cutting edges for high-production jobs.

Give A-H5 a fair trial and you'll find your toolroom can't get along without it.

Wide ranges of sizes for prompt delivery

Large stocks of A-H5 are available for quick delivery from Bethlehem tool-steel distributors everywhere.

HEAT-TREATMENT OF A-H5

	C	Mn	Cr	Mo	V
Typical Analysis:	1.00	0.60	5.25	1.10	0.25

Annealing: Pack, heat to 1650 F, slow furnace-cool, Brinell 212 max
Preheating: 1200 to 1250 F, prior to hardening
Hardening: 1775 F, air-quench
Tempering: 350 to 400 F, Rockwell C 60 to 62

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation

Export Distributor:
Bethlehem Steel Export Corporation

BETHLEHEM STEEL

SUPERSONIC TESTED

Bethlehem Tool Steel

broaching will really save you money on those close tolerance high speed internal gears

HERE'S AN ACTUAL CASE:

The Old Production Line-Up	The Way It's Handled Now
1. Rough Broach	1. Rough Broach
2. Shape	2. Finish Broach
3. Shave	
Required Tolerance .0002"	Required Tolerance .0002"

EQUIPMENT USED:

1 Broaching Machine	4 Broaching Machines
18 Gear Shapers	
2 Gear Shaving Machines	

This plant uses NALOY BROACHES each of which is good for 38,000 gears before it is retired. Naloy broaches have characteristics (and we can prove this) that the average broach shop just doesn't have the facilities to duplicate.

If you want Precision with maximum economy, send for a Red Ring Broach Engineer.

These are actual figures from a well known automotive gear plant which adopted the all-broaching procedure about 2 years ago. Since then savings have been spectacular.

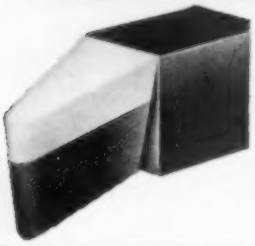
Of course they don't use the garden variety of broaches. The savings and precision achieved would not be possible with ordinary tools.

NATIONAL BROACH AND MACHINE CO.

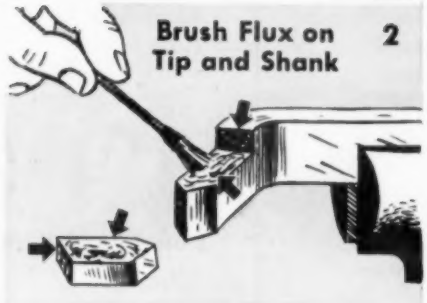
5600 ST. JEAN • • • • • • • • • DETROIT 13, MICHIGAN

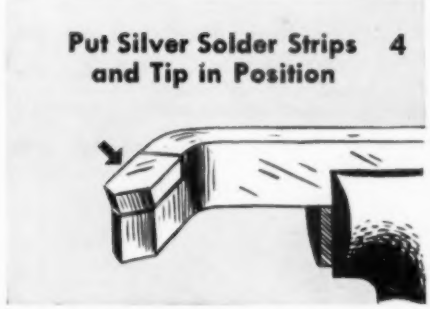
WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

HOW TO MAKE YOUR OWN TIPPED CUTTING TOOLS



The sketches below show how easy it is to make your own tools by silver brazing HAYNES STELLITE tool tips to steel shanks. There are 14 standard shapes of these tips stocked for immediate delivery. Write for a copy of "HAYNES STELLITE Metal Cutting Tools" which illustrates the sizes and types of tool tips available (use the convenient coupon below). You will find prices considerably lower than for solid or welded tip tools.





1. Clean both the tip and the recessed area of the steel shank by light grinding if necessary—then brush with carbon tetrachloride. Clamp shank in vise with bottom surface of recess level.

2. Brush silver-brazing flux generously onto the joint surfaces of both tip and shank.

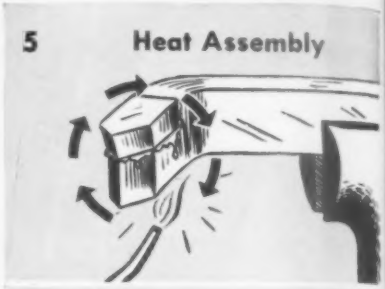
3. From 0.003-in. thick silver solder strip cut pieces slightly over-size for the joint faces of the recess.

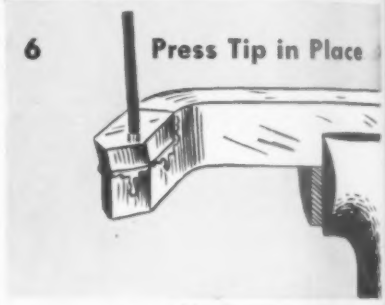
4. Position the brazing alloy strips and place the fluxed tip in the shank recess ready for heating.

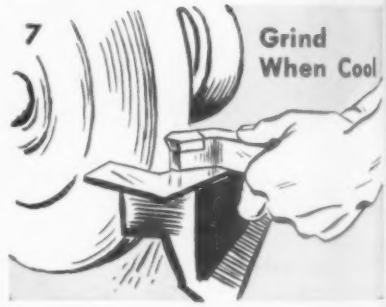
5. Use an oxy-acetylene blowpipe with a reasonably large tip and adjust for a reducing flame. Heat the shank underneath the tip to a cherry red, rotating the flame from bottom to side to top to other side to bottom. (For large quantities of tools, you can do this heating in a furnace at approximately 1450 deg. F.)

6. When the silver alloy melts, move the tip with a rod or tongs into exact position, and then press it just enough to squeeze out excess flux and silver solder. Allow the assembly to air-cool. *Do not quench!*

7. When the assembly is completely cool, remove the excess flux and scale. The tool is now ready for grinding.







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HAYNES *alloys*

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Union Carbide and Carbon Corporation
UCC

The trade-marks "Haynes" and "Haynes Stellite" distinguish products of Union Carbide and Carbon Corporation.

USE THIS HANDY COUPON

Haynes Stellite Division, 725 S. Lindsay Street, Kokomo, Ind.

Please send me, without obligation, your booklet, "HAYNES STELLITE Metal-Cutting Tools."

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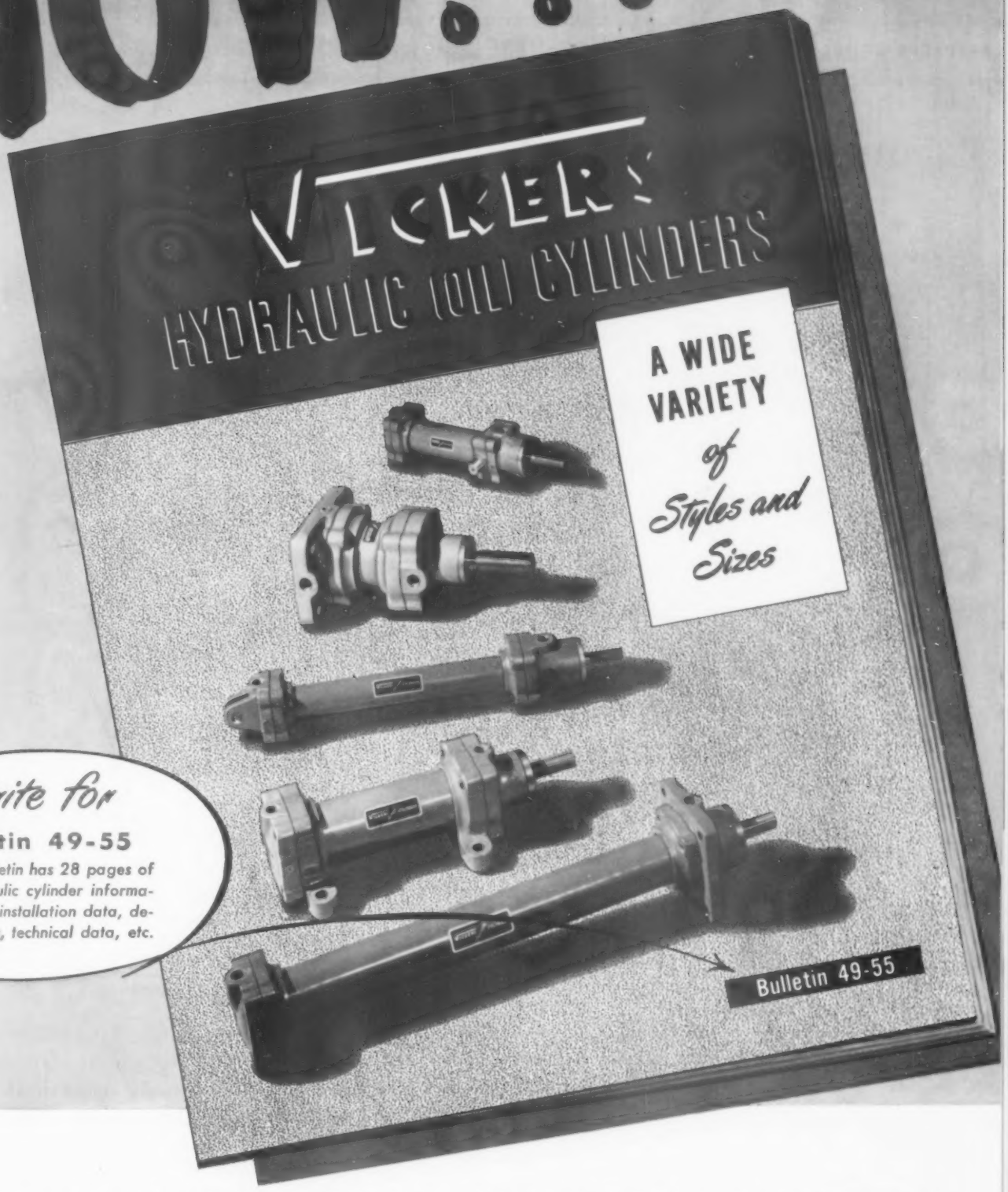
VICKERS HYDRAULIC (OIL) CYLINDERS



Write for

Bulletin 49-55

This new bulletin has 28 pages of useful hydraulic cylinder information such as installation data, design features, technical data, etc.

Vickers now offers a very extensive line of oil hydraulic cylinders . . . cylinders that have important improvements. Vickers Cylinders are of modern design . . . as advanced as the Vickers Pumps and Controls with which they will be used to provide better hydraulic systems. There are 12 standard bore sizes ranging from 1" to 8", and 12 standard mountings with innumerable combinations. For complete information, ask for Bulletin 49-55.

VICKERS Incorporated

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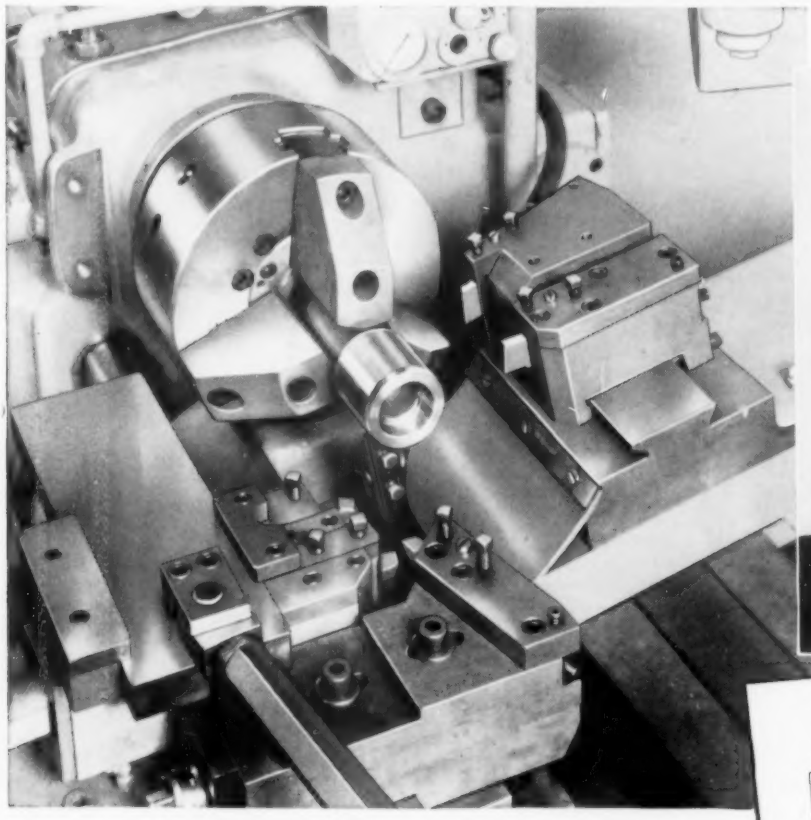
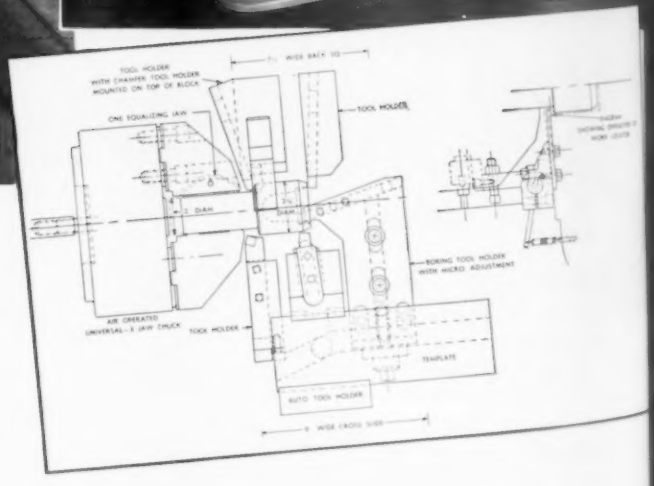
ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. **"THE Lo-swing PEOPLE"** SENECA FALLS, NEW YO





Lo-swing CUTS COSTS ON
CHUCK WORK

Problem: **To turn and chamfer outside diameter, face both ends and bore inside diameter of Idler Shafts in a single automatic operation.**

Solution: **The Model LR Automatic Lo-swing Lathe selected for this job was equipped with a 10″ three-jaw, air-operated chuck having one jaw fitted with a swivel key to compensate for irregularities on the forged stem. The large diameter is turned and the bevel generated with two tools mounted on the front slide which also carries the adjustable boring tool holder and tool. Both ends are faced to length and the inside face chamfer with three tools mounted on the automatic back faci attachment. Line drawing shows work locator whi is automatically shifted to locating position when m chine stops and automatically relieves when machi is started. Operation is entirely automatic. Operat simply loads and unloads chuck and pushes starti lever. Machining time is 39 seconds, floor to floor.**

Engineered jobs are our specialty. Our staff is at yo disposal to assist in solving your problems.

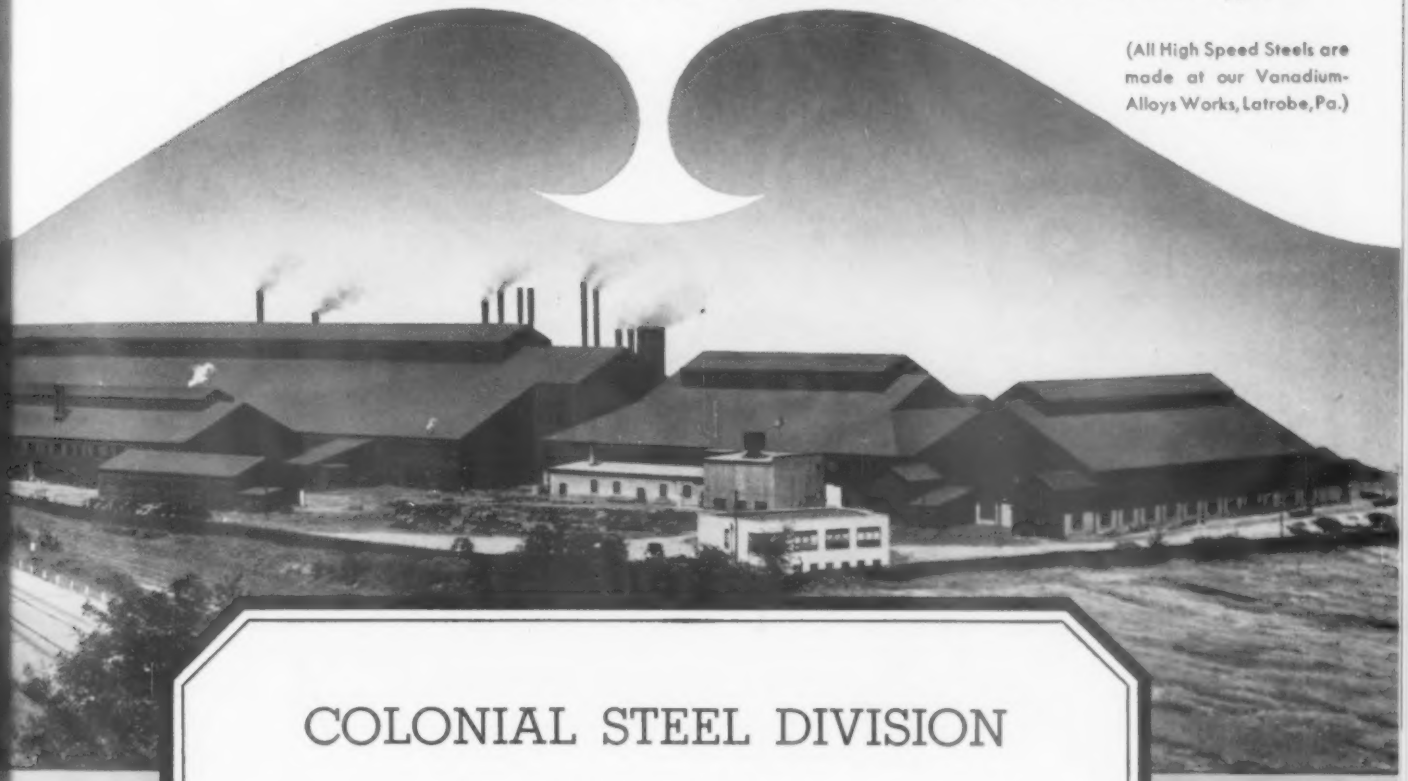
SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH Lo-swing

Specializing

in the production of **CARBON AND ALLOY TOOL STEELS**

SHEET AND PLATE MILL PRODUCTS of all tool steel types



(All High Speed Steels are made at our Vanadium-Alloys Works, Latrobe, Pa.)

COLONIAL STEEL DIVISION

Vanadium-Alloys Steel Company

WIDELY-USED TOOL STEEL BRANDS PRODUCED BY COLONIAL STEEL DIVISION

- Ohio Die
- Crocar
- Colonial No. 7
- Colonial No. 6
- Hotform
- Red Star
- Colonial No. 14
- Silman
- Nikro M
- Air Hard
- Red Star Tungsten
- Speed-Cut

This fine plant—reconditioned since the war—is an important part of Vanadium-Alloys Steel Company's production facilities and an important source of supply for those who wish to use good tool steels. You are invited to inspect Colonial's up-to-the-minute equipment, including pyrometric control of melting, modern controlled atmosphere heating furnaces, supersonic testing apparatus and many other measures employed to insure FIRST QUALITY in all Colonial steels.

FIRST QUALITY TOOL STEELS

Vanadium-Alloys

STEEL COMPANY

LATROBE, PENNA.

Colonial Steel Division Anchor Drawn Steel Co.

. . . with Cost Cutting
32 ALUNDUM Tool Grinding Wheels

4 to 6 Times Faster Cutting

In plant after plant they are finding that the *extra sharpness* of 32 ALUNDUM wheels enables them to remove stock from high speed steel and cast alloy tools at the rate of .002" to .003" per pass as compared to .0005" for ordinary tool wheels.

No Dressing on Multi-tooth Cutters

And "32" wheels *stay sharp* longer. You can go all the way around even a large multi-tooth cutter without having to stop and dress a 32 ALUNDUM wheel.

Less Tool Spoilage

32 ALUNDUM grinding wheels cut so cool that there's far less danger of spoiling heat-sensitive high speed steel tools—even with inexperienced operators.

Here's the Reason for "32's" Record Breaking Performance

— *The grains of 32 ALUNDUM abrasive are produced by a special, patented electric furnace process which gives them many sharp points on all sides—no matter how they are bonded into a wheel each grain presents one or more cutting faces. And because the grains are over 99% pure fused alumina they have exceptional resistance to dulling.*

W-1271

- LATHE TOOLS
- PLANER TOOLS
- MILLING CUTTERS
- REAMERS
- BROACHES
- DRILLS
- TAPS
- CHASERS
- HOBS
- FORM TOOLS
- SLITTING SAWS

NORTON

162 Pages of Practical Information—That's what you get in this Norton Handbook on Tool Room Grinding. It tells you when to use 32 ALUNDUM wheels and when to use the other Norton abrasives—such as 38 ALUNDUM, 57 ALUNDUM and regular ALUNDUM, to cut tool room costs. Send for your copy—just ask for Form 835 -L.

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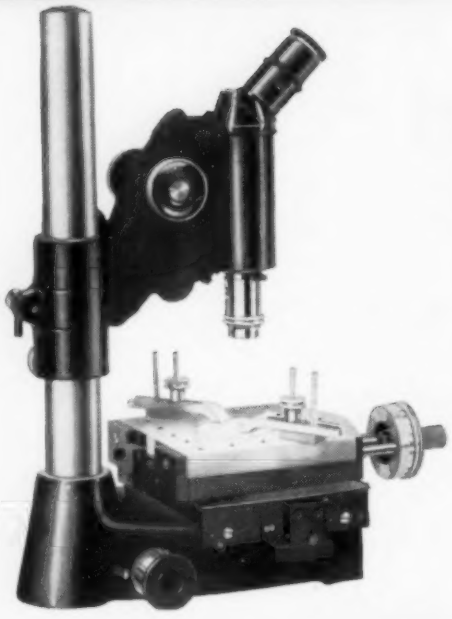

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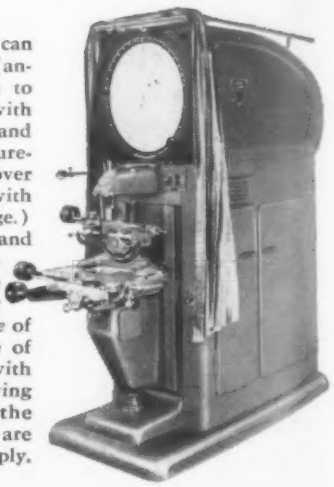

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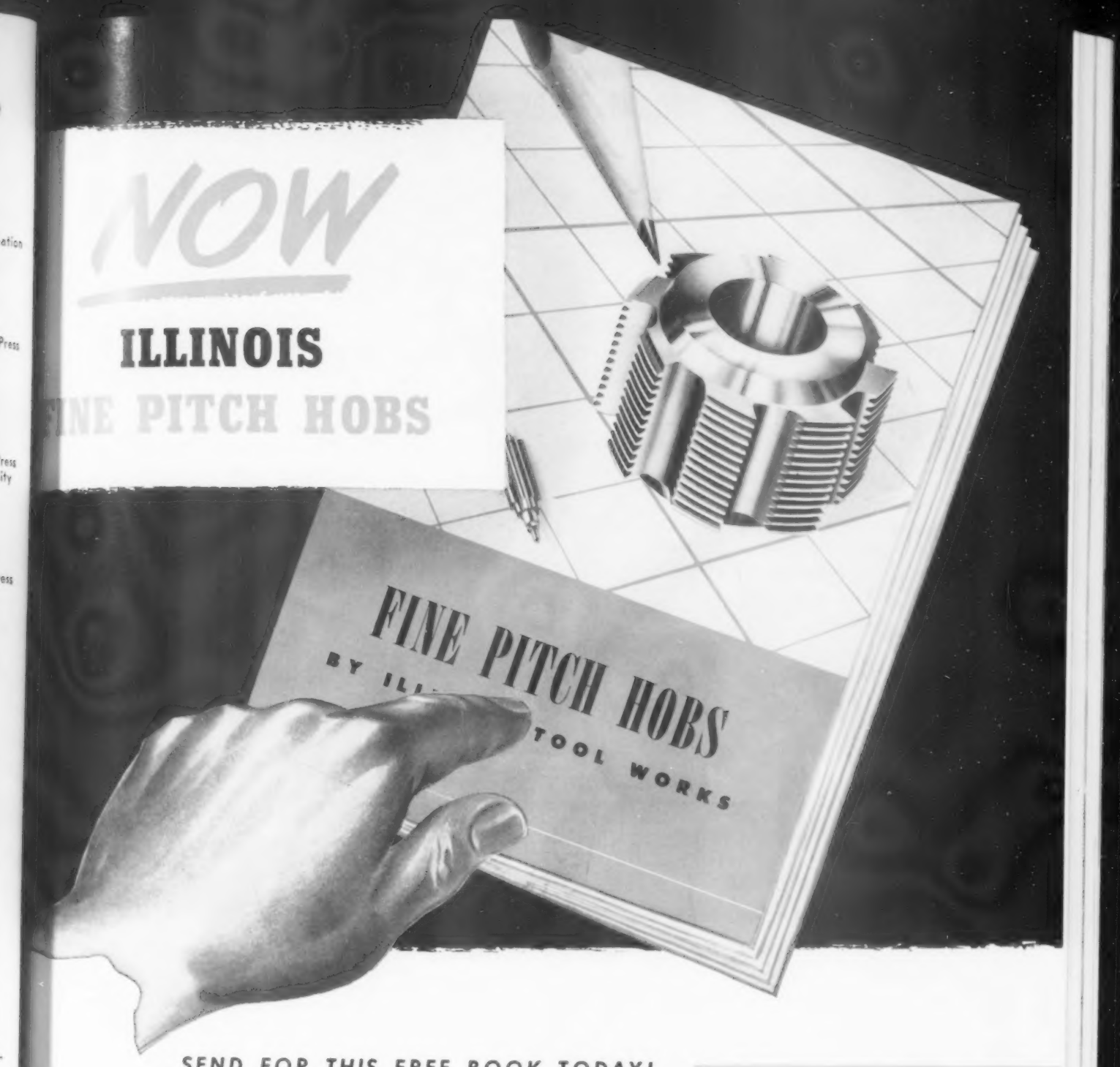

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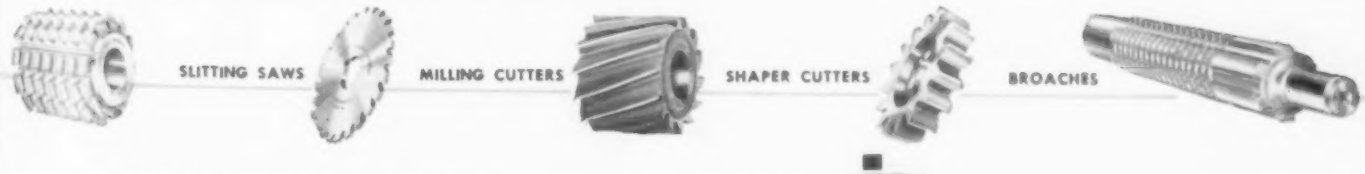
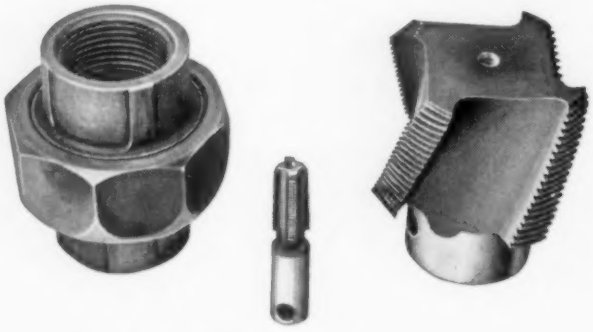


HEADQUARTERS FOR ENGINEERED CUTTING TOOLS

look what can happen when you

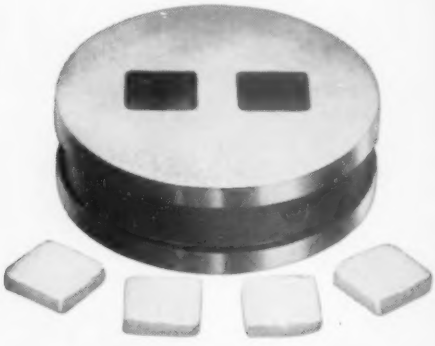
refuse to be satisfied with "EXPECTED PRODUCTION" from tools and dies . . .

Many tooling men have said: " . . . Our tools are running along O.K.—things are satisfactory". Yet, after these men discovered a more foolproof way to select the proper steel for the job, they wondered why they were ever satisfied with "average" tool and die performance. And look at the results they are enjoying:



Operators Objected to the Change . . . But Now They Are Convinced!

Everyone claimed these taps for threading cold forge unions were running along "O.K.". But the T.R.F. wasn't convinced. He used the Carpenter Matched Set Method to pick the one steel best suited for the job—SOLAR (Water-Tough). Now production is up 350%—and today the operators *insist* on taps made from SOLAR! It can happen in your plant—if you *refuse* to be satisfied with "Expected Production".



Production Was Considered "Satisfactory" . . . But That Didn't Stop This Toolmaker:

This die preforms tablets from Bakelite powder on a preform press. Even though the highly abrasive plastic created a wear problem, production was considered "satisfactory". Yet, in a desire to investigate every possibility for reducing costs and boosting output, the toolmaker changed to a steel in the Carpenter Matched Set. Now, with K-W (Water-Wear), the die lasts twice as long as those previously considered "satisfactory"—and 8 to 10 hours are saved between grinds!

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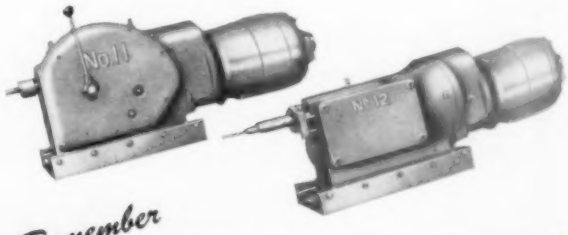

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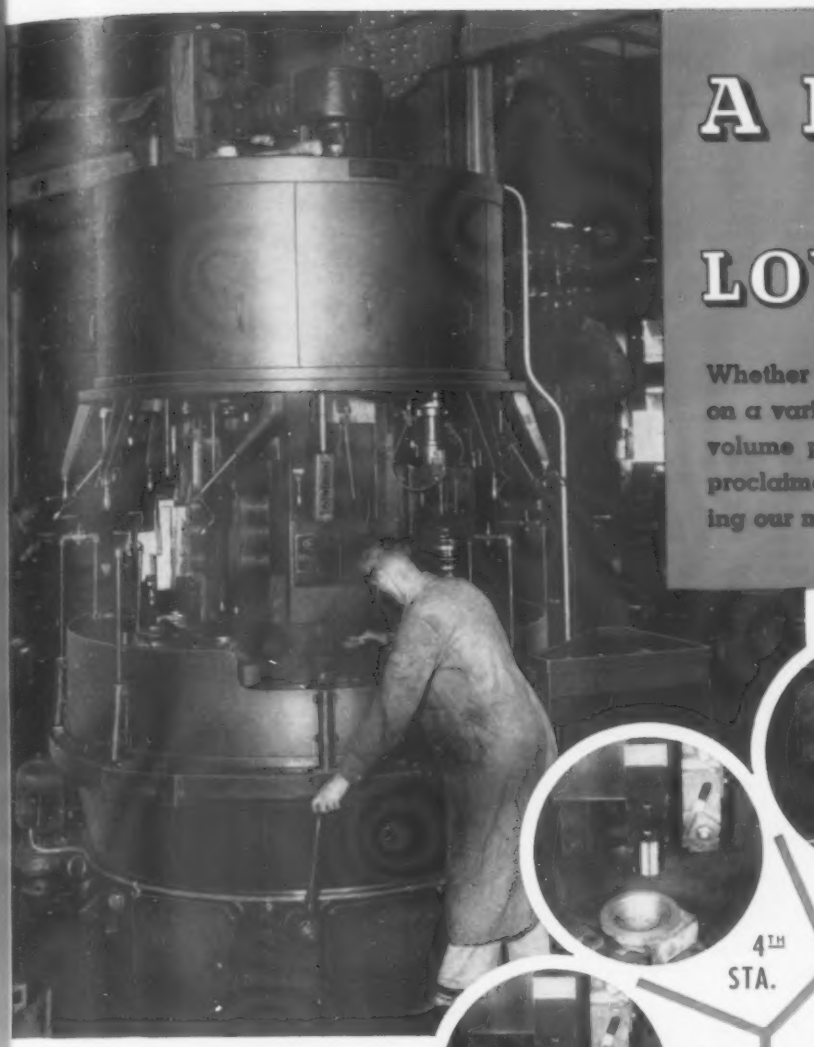

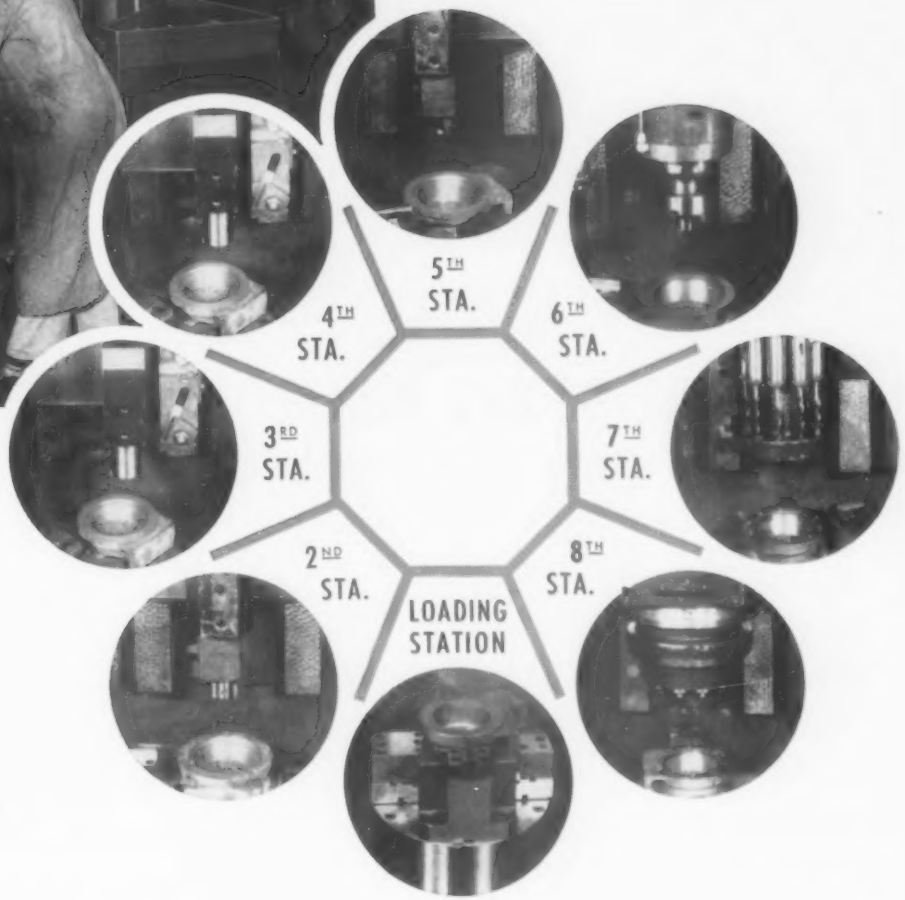

1st Station—:
Loading

2nd Station—:
Rough Bore—Three Diameters

3rd Station—:
Rough Face—Three Surfaces

4th Station—:
Finish Face—Three Surfaces

5th Station—:
Finish Bore—Three Diameters and Chamfer

6th Station—:
Precision Bore—Two Diameters

7th Station—:
Multiple Drill—Ten Holes

8th Station—:
Multiple Tap—Ten Holes

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